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A BRIEF

HISTORY

OF

EPIDEMIC AND PESTILENTIAL DISEASES;

WITH THE

PRINCIPAL PHENOMENA OF THE PHYSICAL
WORLD, WHICH PRECEDE AND ACCOMPANY THEM,

AND

OBSERVATIONS DEDUCED FROM THE
FACTS STATED.

IN TWO VOLUMES.

By NOAH WEBSTER,

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Society in Maſſachuſetts.

VOL. II.

HARTFORD:

PRINTED BY HUDSON & GOODWIN.

1799.

[*PUBLISHED ACCORDING TO ACT OF CONGRESS.*]

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ERRORS.

VOL. I.

PAGE 337, line 12, eraſe the following words—“ *but its progreſs was limited to one ſtreet near the water.*” See the fact in page 345.

340, The laſt paragraph, ſave one, is miſplaced—it belongs to the poſtſcript about the middle of page 347.

310, line 20, for Tome, read *Torre.*

VOL. II.

PAGE 3, In the account of deaths in Dreſden in 1631, for 144; read 844. This correction is material, as the true number marks the increaſed mortality preceding the plague in the two following years; that is, the *progreſſion* in the peſtilential condition of the elements.

52, line 9 from bottom, read *Horſtius.*

178, line 11, for elyſian read *Eteſian.*

182, line 14, for *By* read *But.*

191, line at bottom, read *repealed.*

216, line 3, read *axillary.*

292, line 4, from bottom for obſerved read *obſcured.*

A few literal errors are not noticed; and poſſibly ſome material ones may have eſcaped obſervation.

SECTION IX.

Bills of mortality for the two laſt centuries, with the principal phenomena of the elements.

OUR accounts of diſeaſes and the phenomena of the world, which appear to be connected with them, are altogether imperfect. But in the two laſt centuries, we have a tolerable hiſtory of diſeaſes, and occaſionally an account of the ſeaſons, and remarkable occurrences. In the ſollowing tables, the reader will find the bills of mortality for London, Augſburg, Dreſden, Boſton, one Church in Philadelphia, with a few bills of Paris and Dublin; to which are prefixed ſuch of the remarkable phenomena of the elements, as I have been able to collect. As winter makes a part of two years, the word *ſevere* is ſet againſt the year which preceded the winter. Thus againſt the year 1607, the word *ſevere* refers to the winter of 1607-8. The blanks denote, either that nothing ſingular occurred in thoſe years, or that I have no account of the occurrences. Further enquiries might probably enable me to fill many of thoſe blanks.

Bills of mortality do not exhibit a complete view of epidemics; as ſome of the more remarkable, eſpecially *influenza*, deſtroy but few lives, and the bills of the years when that diſeaſe alone prevailed, are remarkably low. It is often the immediate precurſor of peſtilential diſeaſes in autumn; in which caſes, the bills of the year are very high.

A. D.	SEASONS.		Other phenomena.		DISEASES.	Burials in London.			Buri. in Augſ
	Summer.	Winter.	Comets	Volcanoes.		By common dif.	By the plague.	Total.	
1600					general peſtilence				1775
1601	very dry	ſevere		S. America	plague in Portugal and other places				1570
1602	cool & dry	cold Eng.			influenza, plague				1567
1603				Etna	plague London, and general famin	5773	36269	42042	1488
1604			comet	S. America		4323	896	5219	1298
1605						5948	444	6392	1361
1606						5796	2124	7920	1371
1607	hot	ſevere	comet	Etna	plague in Cork	5670	2352	8022	2595
1608	hot				plague in Cork, dyſentery	6758	2262	9020	1476
1609		ſevere	comet	Etna	plague in Denmark	7554	4240	11784	1469
1610	very dry				influenza, ſore throat in Spain	7486	1803	9289	1941
1611					plague in Conſtantinople	6716	627	7343	1891
1612	very dry		comet		malignant fevers	7778	64	7852	1625
1613					plague in Conſtantinople, fatal fevers in France	7503	16	7519	1722
1614		ſevere		Etna	fatal ſmall-pox epidemic, meaſles in Perſia	7367	22	7389	1444
1615	cool					7850	37	7887	1771
1616	hot and dry				quartan agues general	8063	9	8072	1631
1617	hot and dry					8280	6	8286	1514
1618			4 comets		peſtilence among Indians in America, angina Naples	9596	18	9614	1354
1619				Iceland	peſtilential fevers in France	8000	9	8009	148[illegible]
1620		cold	comet		fevers	9691	21	9712	1667
1621					ſmall-pox	8112	11	8123	1517
1622	dry Amer.		comet			9420	16	9436	1959

A. D.	Summer.	Winter.	Comets	Volcanoes	DISEASES.	London.			Augf	Dref.
1623					malignant fevers, precurfors of the plague	11095	17	11112	1875	421
1624				(Iccla. &	the fame, increafed mortality, previous to the plague	12199	11	12210	1370	411
1625			comet	(Canaries	plague in London, Denmark, Italy and Holland, &c.	18848	35417	54265	1392	481
1626	hot				plague in Lyons, Wittemberg, &c.	7400	134	7534	1440	740
1627					plague in France, &c.	7713	4	7717	2494	412
1628					plague in France, Augfburg, &c.	7740	3	7743	9611	469
1629					plague in Amfterdam, &c.	8771	0	8771	1265	398
1630					plague in Vienna, Cambridge, &c.	9228	1317	10545	909	480
1631				Vefuvius	eryfipelous fevers, difeafes of the throat	8288	274	8562	859	144
1632				Vefuvius	eruptive fevers, plague in Drefden	9527	8	9535	3485	3129
1633	hot	fevere En.	comet	Etna	plague in Drefden, mortality in America, peftil. fevers	8392	0	8392	3364	4585
1634	hot	feve. Am.		Etna	plague at Ratifbon, fevers in London precurfors of the	10899	1	10900	4664	721
1635		mild		Et. & Vef.	plague, Augfburg, Leyden, Mentz, &c. (plague	10651	0	10651	6243	597
1636				Et. & Hec.	plague, London, Nimeguen, Rome, &c.	12959	10400	23359	790	594
1637	hot Eng.	fevere			plague in Holland, Denmark	8681	3082	11763	823	1897
1638	hot & dry				fickly year in America, fmall-pox and fevers	13261	363	13624	638	531
1639	dry Ame.					9548	314	9862	674	1845
1640		fevere En.				11321	1450	12771	586	935
1641		feve. Am.				11767	1375	13142	587	525
1642						11999	1274	13273	593	601
1643	hot & dry			Et. & Vef.	malignant fevers	12216	996	13212	638	1041
1644						9441	1492	11933	659	489
1645	hot Eng.				ficknefs among Indians, America	9608	1871	11479	758	532
1646					plague, London	10415	2365	12780	1488	481
1647	hot Ame.		comet		plague Lond. influenza Amer. fevers (and Shropfhire	10462	3597	14059	1388	471
1648					malig. fevers in Italy, France & Spain, plague in Ireland	9283	611	9894	1208	606

A. D.	Summer.	Winter.	Comets	Volcanoes	DISEASES.	London.			Augſ	Dreſ.
1649					plague in Spain, ſmall-pox in Boſton	10499	67	10566	940	597
1650				Etna	plague in Cork, influenza Europe	8749	15	8764	533	494
1651	hot				quinſy in Italy	10444	23	10467	577	511
1652	dry Eng.		comet		fevers	12588	16	12604	616	450
1653	dry Eng.				ſickly New-England	10081	6	10087	575	535
1654		ſevere			plague Denmark, Cheſter, Turkey, &c.	13231	16	13247	764	558
1655	dry Eng.			Veſuvius	influenza America, general plague Europe	11368	9	11377	570	525
1656	hot				plague Italy, &c.	13915	6	13921	641	560
1657	hot	ſevere			plague Genoa	12430	4	12434	731	663
1658	wet Ame.				influenza Europe, mortality America	14979	14	14993	731	518
1659					cynanche trachealis America	14720	36	14756	831	599
1660				Veſ&Ice.	meaſles England	15104	14	15118	657	542
1661			comet		meaſles, tertians	19791	20	19811	668	649
1662	dry Ame.				ſickly in America	16542	12	16554	788	637
1663		mild			fevers Venice, among cattle England, plague Holland	15347	9	15356	836	620
1664	wet	ſevere	comet	Etna	purple fever Pruſſia, corn mildewed	18291	6	18297	761	662
1665			comet	Etna	plague London, and over Europe	28710	68596	97306	745	699
1666	hot & dry		comets	Etna	dyſentery over Europe, ſmall-pox Boſton	10840	1998	12838	737	824
1667				Etna	fevers Perſia, &c.			15877	769	823
1668		ſevere	comet	Etna	fever New-York, Europe ſmall-pox			17294	711	703
1669	hot	ſevere		Etn.great	dyſentery, fevers, meaſles, cat plague Weſtphalia			19436	743	794
1670				Etna	meaſles London, ſmall-pox			20198	734	776
1671				Etna				15729	733	743
1672		cold	comet	Etna	meaſles and ſmall-pox			18230	768	909
1673	cold Eng.			Etna	catarrhs numerous			17504	751	909
1674				Etna	fevers, meaſles London, and ſmall-pox			21201	842	846

A. D.	Summer.	Winter.	Comets	Volcanoes.	DISEASES.	London	Augſ	Dreſ.
1675	wet & cool E	ſevere	meteor	Etna	influenza Europe	17244	913	947
1676	cold Eng.		meteor	Etna	meaſles and ſmall-pox Genoa, England	18732	913	1284
1677			comet	Etna	ſmall-pox Charleſton, Maſſ. dyſentery Denmark	19067	934	887
1678	dry and hot		comet	Etna	dreadful plague Morocco, ſmall-pox Boſton and S. America	20678	943	1020
1679		ſevere	comet	Etna	catarrhs, plague, Vienna	21730	945	975
1680	hot and dry	ſevere	comet		plague Dreſden, coughs epidemic, dyſentery	21053	976	6414
1681	very dry					23971	860	753
1682			comet	Et. & Veſu.	murrain among cattle, ſpotted fever Dublin, plague at Halle	20691	734	1023
1683		very ſeve.	comet		fevers	20587	808	1200
1684	hot & dry E.	cold			malignant dyſentery over Europe	23202	858	1154
1685	hot & dry E.					23222	848	937
1686	dry Italy		comet	Etna		22609	981	1199
1687	rainy Eu.					21460	855	927
1688		ſevere		Veſuvius	influenza Europe	22921	860	1011
1689	autum. rainy		comet	Et. & Veſu.	ſpotted fevers Germany, ſmall-pox Boſton	23502	806	1163
1690	rainy	ſevere			corn mildewed	21461	1071	1200
1691	hot and dry				ſpotted fevers Europe, corn blaſted, diſeaſes among cattle	22691	785	1166
1692	hot			Etna	malignant fevers	20874	935	999
1693		cold Eu.		Etna & Icel.	influenza Europe	20959	1084	1071
1694	hot			Veſ. & Band.	malignant fevers	24100	1106	1426
1695	rainy Euro.				apoplexies, meaſles, chin cough, ſickly America	19047	1048	1227
1696	cold, wet E.				dyſentery among children, ſpotted fevers	18638	927	1055
1697		ſevere			ſpotted fever Europe, catarrh America began	20970	777	1070
1698		ſevere	comet	S. America	influenza America, ſpotted fever Europe	20183	879	919
1699	hot America		comet		influenza Europe, plague Philadelphia and Charleſton and Levant	20795	940	1139
1700		mild			ſore throat and catarrhs Europe, meaſles	19443	786	1198

A. D.	Summer.	Winter.	Comets	Volcanoes.	DISEASES.	London	Augſ	Dreſ.	Boſt.	
1701	hot & dry			Veſuvius	plague in the eaſt	24071	906	992	146	
1702	hot & dry		comet	Etna	plague Poland, yellow fever N. York, ſmall-pox Boſton	19481	900	946	441	
1703					plague Poland	20720	1245	1078	159	
1704	dry Euro.			Veſ. & Ten.	plague in Poland and Hungary, ſpotted fevers	22684	1313	964	220	
1705					plague in Ruſſia	22097	748	1346	282	
1706	hot, dry E		comet		coughs, dyſentery among children	19847	842	1098	261	
1707	very hot		comet	Ve. new iſla.	meaſles England, plague at Warſaw	21600	805	1523	263	
1708		very ſeve.	meteor		catarrh began in Europe, plague in Thorn	21291	908	1119	291	
1709					catarrh, plague in Dantzick, apoplexies	21800	805	1340	377	
1710					plague in Lithuania, catarrhous fevers Eng. and Holland	24620	811	1214	295	
1711		cold Eur.			plague in Copenhagen, and among cattle terrible	19833	855	1222	363	
1712	wet Eng.		comet	Veſuvius	catarrh Europe, plague in the eaſt	21198	894	1140	316	
1713	wet Eng.	mild			meaſles America, plague in Auſtria	21057	860	1383	480	
1714	dry & hot					26569	948	1250	413	
1715	dry				ſmall-pox and meaſles England	22232	1024	1353	336	
1716	very dry	ſevere				24436	905	1274	355	
1717		ſevere	comet	Veſuvius	catarrhous fevers Europe	23446	988	1908	451	
1718	hot, wet		comet		malignant fevers, plague Turkey	26523	768	1412	380	
1719		cold Am.	meteor		plague Levant, peſtilential fevers, malig. pleuriſy Amer.	28347	997		304	
1720	dry Euro.				plague in Levant and Marſeilles, malig. pleuriſy Amer.	25454	934	1733	329	Epiſ-
1721				Iceland	ſmall-pox Boſton	26142		1850	1102	copal
1722	cold, wet				meaſles England	25750		1519	273	Ch.
1723		cold	comet		ſmall-pox in England, plague Barbadoes	29197		1654	413	Phil-
1724	wet Eng.				whooping cough England	25952	Dub-	1761	407	adel-
1725	wet Eng.			2 in Iceland		25523	in.	1642	324	phia.
1726					plague in Egypt	29647	2763		343	69

A. D.	Summer.	Winter.	Comets	Volcanoes.	DISEASES.	London	Dub.	Boſt.	Phil.
1727	dry hot A.		comet	Veſu. & Ice.	ſickly year	28418	2946	479	130
1728	hot Ame.	ſevere Eu.		Iceland	plague in Egypt and Carolina (and malignant pleuriſy	27810		498	86
1729			comet	Iceland	univerſal catarrh Europe, plague in Aleppo, meaſles America	29722	3206	570	88
1730		very cold E.		Ice. & Veſu.	ſmall-pox in Boſton, peſtilential fevers S. America	26761	2184	909	81
1731					anginas in Holland, ſmall-pox New-York	25262		408	166
1732		ſevere Ame.	comet		plague in Syria, Charleſton and New-York, catarrh began	23358	2534	499	97
1733	dry Eng.				catarrh univerſal, plague in Aleppo	29233	2608	458	103
1734					ſcarlet fever Edinburgh, ſmall-pox and fevers (vers, hydro.	26062	2466	528	116
1735	wet				ſorethroat Am. meaſles, ſwelling in jaws, coughs, catarrhs fe-	23538	2196	455	96
1736	wet				ſore throat Am. & Fr. meaſles Eng. dreadful plague in Egypt	27581	2101	617	144
1737		very ſev. A.	comet	Veſuvius	ſore throat, univerſal catarrh, diſeaſes of horſes	27823		607	112
1738					peſtilence in Barbadoes, Oczakow and New-Spain, meaſles	25825	2506	576	107
1739	wet Eng.	very ſev. Eu.	comet		peſtilence Charleſton, meaſles America	25432	2201	554	97
1740		very ſev. A.			meaſles America, whooping cough and ſpotted fever Eng.	30811		704	98
1741					peſtilence Philadelphia and Virginia, ſpotted fevers England	32169	2790	555	162
1742		ſevere Syria	comet	(at Catapaxi	ſore throat America and England, plague Aleppo, &c.	27483	2320	517	123
1743	hot		comet	(in S. Amer.	peſtilence Syria, Meſſina, N. York, catarrh Italy and France	25200	2193	620	116
1744					epidemic catarrh Europe	20606	1705	499	114
1745					infectious fevers and dyſen. prevalent Am. plague Egypt, &c.	21296		780	125
1746				S. America	infectious fever Albany and among the Indians, dyſen. Switz.	28157	1957	578	186
1747	hot & dry	ſevere		Etna	influen. univerſal, peſtilence Phil. anginas Eng. ſickly Boſton	25494		777	192
1748	dry				peſtilence Charleſton, anginas Eu. long fever Am. and meaſles	23869	1530	740	175
1749	very dry				dyſenteries Europe and America, anginas Europe	25516	1819	677	128
1750	very hot	very ſevere	comet		dyſenteries America and Europe, plague Barbary coaſt	23727	2088	604	125
1751	wet Eng.	ſevere Ame.		Veſuvius	plague Turkey, dyſenteries fatal America and anginas	21028		624	144
1752	ve. hot A.				ſmall-pox in Boſton, anginas in Ireland and America	20485	1844	1009	129

A. D.	Summer.	Winter.	Comets	Volcanoes.	DISEASES.	London	Dub.	Boſt.	Phil.
1753		ſevere			malignant fever in Rouen from vapor, anginas America	19276	1825	481	105
1754		mild Amer.		Veſuvius	gangrenous ſore throat England, Ireland and America	22696	1897	434	94
1755		ſevere Euro.		Etna	catarrhs Europe, anginas Europe and Am. plague Conſtanti.	21917	2002	484	99
1756		ſevere Syria	comet	Iceland	influenza America began	20872	1550	526	213
1757					influenza America, meaſles	21313	1825	434	97
1758	hot		meteor		influenza Eu. plague began in Egypt and Smyr. meaſles Am.	17576	1558	524	129
1759		ſevere	comets	Veſu. great	meaſles and dyſentery America, plague Levant	19604	1752	629	271
1760				Veſuvius	plague extends in Levant, terrible fever in America	19830	1993	576	174
1761	ve. dry A			Azores	influenza America, plague extends Levant, fever America	21063	2292	456	144
1762	ve. dry A	ſevere	comet		influenza Europe, peſtilence Phila. criſis of plague Levant	26326	2490	531	200
1763			meteor	Etna	peſtile. at Nantucket and in Bengal, diſeaſes among animals	26143	2605	407	180
1764	hot Euro.			Etna	yellow fever Cadiz, peſtilence in Naples, ſmall-pox Boſton	23202	2307	548	139
1765	hot Euro.	ſevere Euro.			dyſenteries	23230	2275	560	186
				(Etna, Veſu.			Paris		
1766	(hot and	very ſevere	comet	(and Heckla	dyſentery America	28911	19664	445	133
1767	(dry Eur.	cold	comet	Veſuv. great	influenza Europe	22612	19875	468	121
1768	hot				diſeaſes among horſes America (mong cattle	23639	20808	417	123
1769	hot		comet		ſore throat Boſton and other places, meaſles Am. diſeaſes a-	21847	18427	645	188
1770	wet Eng.		comet	Ter. & Veſ.	ſore throat America and Weſt-Indies, plague Conſtantinople	22434	18719	483	127
1771	wet A. E.	cold Europe	meteor	Veſuvius	plague in Ruſſia, diſeaſes among cattle, catarrhs Am. peſti-	21770	18941	482	139
1772	hot Ame.	A. gr. ſnow			catarrh America and meaſles (lence Bengal	26053	20374	517	157
1773					meaſles, affections of the throat, dyſentery Am. plague Baſ-	21656	18518	595	179
1774		ſevere Euro.			ſcarlet fever Edin. in ſome places in Am. (ſora & Bagdadt	20884		596	161
1775			meteor	Pac. in Gua.	catarrh in Europe, dyſentery in America and anginas	20541	18400		156
1776	hot	ſevere Euro.		Veſuvius	dyſentery America and anginas	19048			180
1777				Ferro	dyſentery in America and meaſles	23334			222

A. D.	Summer.	Winter.	Comets	Volcanoes.	DISEASES.	London	Paris.	Phil.
1778	hot	mild			typhus fevers, plague Conſtantinople	20399	17112	183
1779	hot Eng.	very ſevere		Veſu. great	health	20420		142
1780			halo	Etna	bilious ſever Philadelphia, general health, plague in Smyrna	20517	Salem	155
1781					influenza America	20709	Maſſ.	179
1782	dry Ame.		(me'rs		influenza Europe, ſcarlatina began in Edinburg	17918	175	198
1783	hot	very ſevere	many	Heckla gre.	meaſles and ſcarlatina Amer. famin India, plague in Egypt, &c.	19029	189	232
1784	hot		comet	Veſuvius	plague in the eaſt, angina America, canine madneſs	17828	140	230
1785	dry Euro.	cold		Veſuvius	angina, fevers America	18919	114	166
1786	cool	cold			yellow fever Cadiz, angina America and England	20454	138	156
1787	cool		(comet	Et. & Veſu.	plague Barbary coaſt	19347	110	147
1788	rainy Am.	cold	meteor		meaſles began N. York and Phila. codfiſh ſickly, influenza Eu.	19697	144	126
1789	(cool ſpri. (hot ſum.	(ſevere Eur. (mild Amer.	halo	Veſuvius	famin in Aſia, dearth in America, meaſles America and influenza, death of haddock Europe, plague in the eaſt.	22744	129	164
1790					influenza America (and Grenada	18038	203	145
1791	ve. hot A.	cold			plague began in Egypt, bilious peſtilence began in New-York	18760	148	183
1792					plague in Egypt, ſcarlet fever began in America	20213	148	125
1793	hot,dry A	mild Amer.	comet		ſcarlet fever Am. and Eng. peſtilence Phil. dyſentery Maryland	21749	148	393
1794	America	ſevere Euro.		great, of Ve.	ſcarlatina, peſtilence New-Haven and Baltimore, dyſentery	19241	122	172
1795	hot, rainy autumn				ſcarlatina, peſtilence New-York and Norfolk, dyſentery New-Haven, influenza England	21179	195	223
1796	ver. dry A	cold Amer.			ſcarlatina, peſtilence N. York, Boſton, Charleſton, Newburyport, meaſles America	19288	216	213
1797	cool Am.	ſevere Ame.	comet	Andes and Guadaloupe	influenza Europe, peſtilence Phil. Balti. Prov. Norfolk, and among cats and other animals in Turkey, canine madneſs	17014	147	197
1798	very hot	long and ſe-	comet	Teneriffe	peſt. Phil. N. York, Boſt. N. Lond. Portſ. Wilming. in Turkey			
1799	ve. dry A	(vere A.& E.			peſtilence Philadelphia, New-York, Hartford			

SECTION X.

Remarks on the preceding Hiſtory and Tables.

IMPERFECT as ancient hiſtory is, in regard to the accounts of diſeaſes, and the extraordinary phenomena of nature, we find that between the year B. C. 480 and the Chriſtian era, a number of violent plagues occurred, moſt of which coincided in time with the following phenomena, comets, eruptions of volcanoes, earthquakes, drouth, ſevere winters, diſeaſes among cattle. Of thirteen comets mentioned in the foregoing hiſtory, which are all whoſe dates I am able to aſcertain, *eight* of them coincide with volcanic eruptions of Etna, the only volcano of any note, which the hiſtory of that period has recorded; and *eleven* of them coincide in time with peſtilence. If we conſider the ſcarcity of our materials for a hiſtory of theſe phenomena, at that period, and make due allowances for the uncertainty of chronology, we ſhall find reaſon to be ſurpriſed at ſuch a number of theſe coincidences. In ſeveral inſtances we find extreme drouth and very ſevere winters to correſpond in time with comets and eruptions of Etna, conformable to facts in modern days.

On this ſubject, hiſtory is barren alſo for many centuries after the Chriſtian era. Yet in every period, even in the dark ages, we find numerous coincidences of the great phenomena above mentioned. All the great plagues that have afflicted mankind, have been accompanied with violent agitations of the elements.*

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* Modern philoſophy objects to the popular ſenſe in which the word, *elements*, is uſed; ſince it appears that what has uſually been conſidered as an *element*, is found by modern chymiſtry to be a compound ſubſtance, reſolvable into parts, in their nature and properties, diſtinct. Notwithſtanding theſe diſcoveries, I cannot conſent to diſcard the popular uſe of the word *element*. Nature preſents to the ſenſes of man, fire, earth, air and water, in a particular and predominant form.

This obſervation reſts particularly on the events that preceded and attended the peſtilences of the following periods. A. D. 80—167—252—375—400—445—542—558—590—639—679—682—745—762—802—905—994—1005—1031—1044—1069—1106—1135—1142—1162—1181—1222—1242—1300—1347—1368—1400—1477—1500—1531—1577—1602—1625—1636—1665—1699—1709—1719—1728—1743—1751—1760—1770—1783—1789. Many facts in other periods concur to prove the truth of the remark.

The phenomenon moſt generally and cloſely connected with peſtilence is an earthquake. From all the facts that I can find in hiſtory, I queſtion whether an inſtance of a conſiderable plague in any country, can be mentioned, which has not been immediately preceded or accompanied with convulſions of the earth. If any exceptions have occurred, they have eſcaped my reſearches. It does not happen that *every place* where peſtilence prevails, is ſhaken; but during the progreſs of the diſeaſes which I denominate *peſtilence*, and which run, in certain periods, over large portions of the globe, ſome parts of the earth, and eſpecially thoſe which abound moſt with ſubterranean fire, are violently agitated.

By adverting to the foregoing hiſtory, the reader will find that all thoſe years, in which conſiderable earthquakes have occurred in America, have been remarkably ſickly. Theſe years are 1638, 1647, 1658, 1662 and 3, 1668, 1727, 1755, 1783. See the hiſtory and the bills of mortality. Even the ſlighter ſhocks, have been attended with conſiderable ſickneſs, or have introduced a ſeries of epidemics, being cotemporary with the meaſles, influenza or ſore throat; as in 1669, 1720, 1737, 1757, 1761, 1769, 1771, 1791, 1797.

To enumerate the inſtances in Europe and Aſia, would be a uſeleſs repetition of the events related in the preceding hiſtory, to which the reader is referred.

Another phenomenon, which, next to earthquakes, appears

This is the form in which they appear to be moſt uſeful to man, and to be the conſtituent materials of other ſubſtances, as well as the agents in carrying on the great viſible operations of the ſyſtem. I therefore conſider the popular diſtribution as natural and convenient.

to be moſt cloſely connected with epidemic diſeaſes, is the eruption of fire from volcanic mountains. In this article, hiſtory is deficient, or I have not been fortunate enough to find the works neceſſary to furniſh a complete view of theſe phenomena. There are whole centuries in which the books I have conſulted, mention no eruption of Etna and Veſuvius. The account of eruptions in Iceland, from the year 1600, taken from Pennant's Arctic Zoology, vol. 1. 331, is probably complete, or nearly ſo. Of the volcanoes in the Andes, we have very few accounts; as well as of thoſe in the Moluccas. Of thoſe in the Arctic regions of Aſia and America, we know very little.

Notwithſtanding theſe defects, we are able, by the eruptions in Italy, Sicily and Iceland, to arrive to ſome very important concluſions. The reader muſt have noticed, in the preceding hiſtory, the coincidences in time between volcanic diſcharges, and winters of unuſual ſeverity. Theſe diſcharges either precede or follow the winter. Thus the eruptions of 1766, 1779 and 1783, were immediately followed by intenſely cold winters. The ſevere winters of 1762-3 and 1779-80, were ſpeedily followed by eruptions. Theſe inſtances will ſerve as ſamples of the ordinary courſe of theſe events. Sometimes the eruptions continue or are repeated, for a number of years in ſucceſſion; but the eruptions when continued are moderate and the ſeaſons variable. When the volcanoes have been, for ſome years, quiet, and that ſuſpenſion is followed by a great diſcharge, it appears to me that ſevere winters invariably follow or precede the diſcharge, within a few months. So alſo when an eruption is continued for a number of years, if at any time the diſcharge becomes violent, a ſevere winter attends it; as in 1669. Etna was in a ſtate of eruption from 1664 to 1679; but in 1669, the diſcharge was immenſely augmented, and the winters next preceding and following, were very ſevere.

There are ſome years in which eruptions are noted, of which I find no account, reſpecting the ſeaſons. Perhaps ſome of theſe will, on further inveſtigation, be found to be exceptions.

It is to be obſerved that, in ſome caſes, a ſevere winter extends to both hemiſpheres, ſometimes to one only, and in a few caſes, to a part of a hemiſphere only. Thus in 1607-8—1683-4—1762 3—1766-7—1779-80—1783-4, the ſeverity extended to both hemiſpheres. In 1640-41—1739-40, and in other inſtances, the ſevere winter in Europe preceded, by one year, a ſimilar winter in America. In a few inſtances, ſevere froſt takes place in one hemiſphere, during a ſeries of mild winters in the other ; but this is leſs common. In general, the ſeverity happens, in both hemiſpheres at once, or in two winters in immediate ſucceſſion ; and as far as evidence has yet appeared, this ſeverity is cloſely attendant on volcanic diſcharges, with very few exceptions.

Another phenomenon which uſually coincides in time with ſevere winters, is the approach of comets. I have been ſtruck with ſurpriſe at the coincidences of this kind. There are a few inſtances on record of mild winters, during the appearance of theſe bodies ; but in theſe caſes, the comets have appeared to be ſmall, or to paſs the ſyſtem at an immenſe diſtance from the earth. The large comets and thoſe which approach near to the earth, *ſeem* to produce almoſt uniformly great heat, exceſſive drouth, followed by very cold winters, tremendous ſtorms of wind, rain, ſnow and hail, unuſual tides or ſwell of the ocean, and uſually, volcanic eruptions. How far theſe phenomena are connected, as cauſe and effect, future obſervations may determin. Some of them occur ſo uniformly in the ſame year, that I cannot reſiſt the evidence of their connection.

After a volcano has been many years quiet, its diſcharges are, I believe, always preceded by extreme drouth ; and this defect of water is not only obſervable in the vicinity of the volcano, but often extends over a whole continent, if not over the world. Many inſtances have been related ; it is ſufficient here to mention the exceſſive drouth in 1762 and 1782, preceding eruptions of Etna and Heckla. In theſe years, almoſt all ſprings were exhauſted over a great portion of America.

Cold winters ſometimes follow wet ſeaſons, but more generally a very hot ſummer or very dry autumn. Sometimes two or three ſevere winters occur in ſucceſſion, as in 1766, 67 and 68—and in America from 1796 to 1799.

The years when comets approach, or volcanoes diſcharge fire, and when the atmoſphere exhibits fiery appearances, as meteors, ſtreams of light, and mock ſuns, are, beyond compariſon, the moſt tempeſtuous. Witneſs the years 1766, 1771 and 72, 1780, 1783, 4 and 5, 1788, 1797. In ſuch years, the riſk on veſſels at ſea, is greatly increaſed.

As dry ſeaſons uſually precede volcanic eruptions, ſo very wet ſeaſons often follow them. This ſeems not to be the invariable courſe of events; but there are remarkable inſtances of deluging rains after theſe diſcharges. Witneſs the ſeaſons following the univerſal convulſions of the earth in 1692 and 3, and 1766. Thus, the electricity is re-conducted to the earth.

In every caſe, I believe this remark will be found true; that the approach of comets, and volcanic eruptions diſturb the regular courſe of the ſeaſons. The heat of ſummer and the cold of winter are in extremes; more ſnow is generated in winter, and more hail in ſummer; tempeſts are more violent and frequent; meteors more numerous, and rain more unequally diſtributed over the earth.

A ſeries of epidemic diſeaſes, meaſles, influenza, affections of the throat, followed by peſtilential fevers, appear generally to commence and take their departure, from ſome of the great agitations of the elements above recited. This at leaſt has been the caſe in America in the four laſt periods, beginning with 1756-7, 1769 and 70, 1782 and 3, 1788 and 9. This fact will want no authority but a bare inſpection of the preceding hiſtory, and tables.

The continuance and the varieties of the diſeaſes ſeem to depend on ſimilar diſturbances in the elements; and as the diſcharges and motions of the electrical fluid depend on no certain laws that are known, they are irregular, and may contribute to vary the order, and the nature of diſeaſes. In ſome caſes, there has been a continued ſeries of epidemics, for twenty years, in which the common order is not exactly obſerved; but this is not frequent. A remarkable inſtance occurred between 1727 and 1744.

Thoſe periods in general have been moſt diſtinguiſhed for ſickneſs over the world, in which the fire of the earth has exhibited the moſt numerous and violent effects. Witneſs the period from 1631 to 1637, when the three moſt noted volcanoes diſcharged immenſe quantities of fire and lava; and ſevere peſtilence extended over all Europe and America. A ſimilar remark may be made concerning the period of the laſt univerſal peſtilence in Europe from 1663 to 1666—alſo from 1691 to 1695—from 1727 to 30—1759 to 1764—1769 to 1772—1774 to 1777—1783 to 1786—and concerning ſome ſhorter periods, all of which produced epidemics in both hemiſpheres.

Slighter eruptions and earthquakes, which are almoſt annual, ſeem to have leſs effect. The fire of the globe is in perpetual motion or action, and to this great agent, philoſophers are agreed, are to be aſcribed the changes of ſeaſons, and the generation of rain, hail and ſnow. Its operations however are not all of them viſible, nor even perceptible, until they appear by their effects. It is probable that the *inviſible* operations of the electrical fluid produce more effects than thoſe which are ſeen. Indeed, we may queſtion whether moſt of the viſible phenomena of that principle, are not mere *effects* of that action which influences the vegetable and animal world. It is probable to me that neither ſeaſons, earthquakes, nor volcanic eruptions, are the cauſes of the principal derangements we behold in animal and vegetable life, but are themſelves the *effects* of thoſe motions and inviſible operations which affect mankind. Hence catarrh and other epidemics often appear, *before* the viſible phenomena of eruptions and earthquakes.

P. S. After this work was prepared for the preſs, I was favored by Dr. Mitchill, with ſome extracts from a paper of Mr. Holm, a Swede, on the ſubject of a volcanic eruption in Iceland, in 1783, by which it appears that the atmoſphere is rendered peſtilential by diſcharges of fire and lava from the earth. This effect is ſuppoſed to be wrought by a combination of the ſeptous and oxygenous parts, and may confirm and improve Dr. Mitchill's theory of peſtilential air.

This eruption I underſtand to have been a burſting of fire from the earth, in a place diſtant from Heckla. In the neighborhood of the column of flame were generated ſnow, hail and extreme cold. The water that fell in rain was acid and corroſive; deſtroying cattle and men—covering the bodies of cattle with puſtles and ulcers, and excoriating the hands and faces of men when it fell on them. It alſo killed vegetables. The effects were felt not only in Iceland, but in Norway, and other parts of Europe.

Had this treatiſe fallen into my hands ſome months ago, I might have been able to illuſtrate particular parts of my theory by authentic facts, taken from that work. As it is, I muſt content myſelf with obſerving, that Mr. Holm's obſervations verify my ideas, reſpecting the agency of electricity in producing peſtilence, and extremes in the ſeaſons. On this theory not only peſtilence, but ſevere cold, and extreme heat, hail and ſnow are all familiarly explained, and their connection with volcanic eruptions, and other electrical operations, viſible and inviſible, demonſtrated.

SECTION XI.

Peſtilential periods exhibited by means of an increaſe of mortality in diſtant parts of the world.

AS there are certain periods when particular epidemics prevail over the world or over a hemiſphere, and when all other diſeaſes aſſume peculiar malignancy, I have here ſubjoined a number of bills of mortality, for different and diſtant places, to ſhow the effect of the general principle of diſeaſe in remote countries or towns.—Some of theſe periods appear in the foregoing tables, as that between 1623 and 1627; and between 1631 and 1637.—

A ſimilar period occurred between 1718 and 1721.

	Burials in			
A. D.	London.	Amſterdam.	Vienna.	Breſlaw.
1716	24,436	7078		
17	23,446	7451	5205	1458
18	26,523	8644	6110	1255
19	28,347	9726		
20	25,454	7820	6825	1816
21	26,142	7632	6490	1482

The plague raged in Turkey and Syria in 1718-19 and 20, alſo at Marſeilles in 1720, in which years or one of them, the bills of mortality were ſwelled, even in the north of Europe. I regret that ſome of the bills are deficient.

The period from 1725 to 1732 is equally remarkable.

	Burials in		
A. D.	London.	Amſterdam.	Dublin.
1725	25,523		
26	29,647	9,275	2763
27	28,418	13,775	2946
28	27,810	11,164	
29	29,722	9,618	3206
30	26,761		2184

Plague in Egypt and the Levant during this period.

From 1739 to 1743.

BURIALS IN

A. D.	London.	Amſterdam.	Dublin.	Boſton.	Church in Phila.
1739	25,432	7566	2201	554	97
40	30,811	10,066		704	98
41	32,169	9864	2790	555	162
42	27,483		2320	517	123
43	25,200		2193	620	116

Plague in Levant, Italy and America.

From the year 1744 to 1757 there were many ſickly years, but no one diſtinct period when an increaſe of mortality is obſervable in all parts of the world, at the ſame time.

From 1758 to 1764.

BURIALS IN

A. D.	London.	Amſterdam.	Dublin.	Boſton.	Church in Phila.
1758	17,576		1558	524	129
59	19,604		1752	629	271
60	19,830	7700	1993	576	174
61	21,063	7720	2292	456	144
62	26,326	8412	2490	531	200
63	26,143	9876*	2605	407	180
64	23,202	8585	2307	548	138
65	23,230	7725	2275	560	186

Plague in Egypt and the Levant from 1758 to 1763. Yellow Fever in Philadelphia in 1762.

From 1770 to 1773.

BURIALS IN

A. D.	London.	Paris.	Amſterdam.	Boſton.	Church in Phila
1770	22,434	18,719		483	127
71	21,770	18,941	7983	482	139
72	26,053	20,374	10,609	517	157
73	21,656	18,518†		595	179
74	20,884			596	161

Plague raging in the eaſt.

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* This bill is ſtated in the Annual Regiſter at 10,506.

† In Anderſon's Hiſtory of Commerce, Continued, vol. 5. 228, the number of deaths in Paris in 1773 is ſtated to have been 28,518.

The ſeries of epidemics, in this period, meaſles, influenza and ſore throat, were followed by dyſentery in America from 1775 to 1777 incluſive, the mortality of which will appear from the following bills.

Burials in

A. D.	A Church Phi.	Hartford.	Litchfield.	Trinity Church Boſton.	Total.
1774	161	31	27	24	243
75	156	74	31	48	309
76	180	79	82	30	371
77	222	72	120	48	462
78	183	58	32	63	336
79	142	49	34	35	260

It is probable the mortality in the northern ſtates of America was every where in that proportion. The ſame diſeaſe made ſimilar ravages between 1749 and 1753—in 1759—1765 and 6—in ſome places in 1769.—It was remarkably mortal in 1773. This latter year was in America unhealthy. In Salem, Maſſ. the bill of 1773, was raiſed to 208, (double the uſual amount) by the dyſentery. The bill for St. Peterſburgh in Ruſſia, was ſwelled in 1773, one fifth, and in 1777, one fourth.

The laſt epidemic period, ſave one, was from 1781 to 1787 incluſive. The diſeaſes were influenza, meaſles and ſcarlatina. Theſe were in general lighter than uſual. In the interior of New-York ſtate, Vermont, Maſſachuſetts and New-Hampſhire, the ſcarlatina was more ſevere and mortal; but on the ſea board and eſpecially in Connecticut, it was milder, and many places wholly eſcaped it. Yet every where the bills of mortality were ſwelled in 1783, 4, 5 or 6, when the plague was raging in the Levant and Egypt. This period was cloſed by remarkably cool ſummers, and no dyſentery or peſtilential fever of any conſiderable violence or extent, ſucceeded.

Burials in

A. D.	Epiſco. Church Philad.	Trin. Chur. Boſto.	Hartford Con.	Wethersfield.	Litchfield.	Guilford.	North-Haven.	Total.	
1779	142	35	49	25	34	17	11	303	health.
80	155	44	36	17	24	25	10	311	health.

1781	179	41	37	20	35	17	15	344	influenza.
82	198	39	34	31	34	18	9	363	do. Europe.
83	232	56	42	46	42	19	8	445	meaſles
84	230	61	33	31	34	22	15	426	& angina.
85	166	41	44	24	30	18	6	329	angina.
86	156	49	50	37	36	19	9	356	angina.
87	147	32	37	19	34	24	8	301	health.

The ſcarlatina and meaſles produced their principal effects, it will be obſerved, in Philadelphia and Boſton. The plague raged in Egypt principally in 1783 and 4, and the ſcarlatina appeared in Britain, but without very conſiderable mortality. In 1787 the plague prevailed in Egypt and on the Barbary coaſt; and diſeaſes of the throat were prevalent in England and ſome parts of America.

Laſt epidemic period from 1789 to 1797 incluſive.

BURIALS IN

A. D.	Philadelphia.	Epiſco. Ch. N. York.	Preſby. Ch. N. York.	Ger Lu. Ch. N. York.	Total.	
1789	1027	337	109	59	1532	meaſles and influenza.
90	888	310	107	52	1357	influenza.
91	1290	257	84	60	1691	fever began New-York.
92	1497	404	121	66	2088	ſcar. began, plague Egy.
93	5304	467	101	76	5948	ſcarla. peſti. hot & dry.
94	1135	413	71	71	1690	ſome fevers, tempe. ſum.
95	2274	554	137	71	3040	peſtilence, hot & humid.
96	1602	540	186	62	2390	peſtilence New-York.
97	1689	399	130	51	2269	peſti. Phil. cool ſummer.

The reſults above are not perfectly accurate, for the bills in Philadelphia, it is underſtood, are from Auguſt to Auguſt; thoſe in New-York commence with the year. The bill of the Preſbyterian Church in New-York, for 1797, is by eſtimate; the others are taken from regiſters.

View of this epidemic period in Connecticut:

A. D.	Two Soci. Hartford.	N. Haven City.	Guil-ford.	Litch-field.	Wethers-field.	North-Haven.	Corn-wall.	Southing-ton.	N. Lon-don.	Oxford Derby.	Total.
1789	48	51*	20	33	35	10	6	17	58	21	299 meaſl. &
90	38	50*	20	54	36	10	10	24	81	18	341 (influen.
91	41	50*	21	41	20	4	6	10	60	17	270 health.
92	41	51	15	23	37	7	8	12	51	12	257 health.
93	65	70	29	80	40	18	10	20	70	11	413 ſcarlatin.
94	109	180	54	56	47	32	19	34	60	39	630 do & fever
95	88	159	55	35	34	15	9	15	86	11	507 dyſentery
96	75	67	19	40	42	12	15	27	80	14	391 meaſles.
97	59	58	25	40	18	7	8	17	101	12	345 health.

It will be obſerved that the principal effect of the epidemics, was in 1794, except in Litchfield, in the weſtern part of the ſtate.

*** *Note*—The number of deaths in New-Haven for 1789, 90 and 91, is ſet down by *eſtimate*, the other bills are from regiſters.

View of the ſame period in Boſton and the neighborhood:

A. D.	Dr. Lathrop's Church.	Dr. Elliot's.	Late Dr. Belknap's.	Tri. Ch.	Stone Chapel.	Salem.	Charles-town.	Total.
1789	52	37	10	50	10	129	22	310 influenza.
90	51	40	8	46	14	203	35	397 do. & meas.
91	34	37	8	31	16	148	26	300 health.

1792	43	46	16	60	32	148	32	377	do. ex. ſm:
93	24	30	11	44	22	148	32	312	do. [pox.
94	45	43	12	33	22	122	26	303	do.
95	34	37	12	45	28	195	38	389	ſcarlatina.
96	37	34	16	50	28	216	65	446	ſcarla. fev.
97	37	25	10	47	22	147	49	337	health.

Let it be noted that the effect of the ſcarlatina was here in 1795 and '96. The progreſs of the diſeaſe is diſtinctly marked to be from New-York eaſtward, from 1793 to 1796. The ſcarlatina in 1785 and 6, was moſt ſevere in Maſſachuſetts—that in 1794, in Connecticut. The bills in Boſton for 1792 were ſwelled by the ſmall-pox by inoculation, which is not to be taken into this account of epidemics. The year ſelected was rather unfavorable, as the condition of the atmoſphere was inflammatory, and inclined to produce eruptive complaints. The ſcarlatina was then making its appearance in the middle ſtates. The ſpring of 1793, when inoculation was begun at Hartford, was ſtill more unfavorable ; and the ſmall-pox was ſo unmanageable as to ſurpriſe the faculty. The principles unfolded in this treatiſe will ſolve the difficulty.

By a bill of mortality for Madeira, it appears that the peſtilential principle of the years from 1760 to 64, extended to that healthy iſland.

A. D.	BURIALS.
1759,	1136.
60,	1356.
61,	1746.
62,	1366.
63,	1118.
64,	1325.
65,	1267.
66,	1037.

The following bills for ſeveral religious ſocieties in Connecticut, will exhibit a general view of epidemics from the year 1750.

	Burials in					
A.D.	Guilford 1 ſociety.	Hartford 2 ſocieties.	Litchfield 1 ſociety.	Middletown 1 ſociety.	New-Haven 1 ſociety.	
1750	19	—	—	—	—	
51	65	64	—	—	—	dyſentery and angina for 3 or 4 years.
52	28	—	—	—	—	
53	25	29	—	—	—	
54	15	20	21	—	—	anginas.
55	22	33	16	—	—	anginas in ſome places.
56	46	32	28	—	—	dyſentery in many places.
57	17	30	12	—	—	catarrh.
58	17	36	15	—	—	meaſles.
59	20	48	28	—	—	meaſles, dyſentery and fevers.
60	29	36	24	—	—	
61	18	42	16	—	—	influenza.
62	18	34	22	24	—	plague Philadelphia.
63	18	34	16	22	13	
64	28	42	25	25	19	
65	15	24	22	35	17	dyſentery.

A.D.	Guilford 1 ſociety.	Hartford 2 ſocieties.	Litchfield 1 ſociety.	Middletown 1 ſociety.	New-Haven 1 ſociety.	Wethersfield 1 ſociety.	Cornwall.	
1766	12	46	17	29	20	—	—	dyſentery in ſome places.
'67	20	34	22	26	15	—	—	
68	21	17	31	30	21	—	—	
'69	43	27	19	27	31	—	—	angina and dyſentery, meaſles.
'70	14	34	18	41	15	—	—	angina, meaſles.
71	10	32	35	38	18	—	—	catarrh, angina.
72	17	33	36	38	19	—	—	influenza and meaſles.
73	35	32	36	39	42	—	—	meaſles, angina, dyſentery.
74	13	31	27	30	21	—	—	
75	29	74	31	63	21	59	10	angina and dyſentery very fatal.
76	32	79	82	78	31	59	20	
77	29	72	120	42	14	40	21	
78	21	58	32	37	15	27	3	
79	17	49	34	19	21	25	15	
80	25	36	24	35	12	17	6	
81	17	37	35	37	15	20	16	influenza.
82	18	34	34	45	21	31	8	influenza in Europe.

A. D.	Guilford 1 ſociety.	Hartford 2 ſocieties.	Litchfield 1 ſociety.	Middletown 1 ſociety.	New-Haven 1 ſociety.	Wethersfield 1 ſociety.	Cornwall.	
1783	19	42	42	70	12	46	17	meaſles, angina began, but ſcarcely perceived by the burials in Connecticut.
84	22	33	34	41	12	31	8	
85	18	44	30	40	17	24	5	
86	19	50	36	28	23	37	4	
87	24	37	34	26	20	19	20	
88	23	45	27	24	41	22	4	
89	20	48	33	43	14	35	6	meaſles, influenza.
90	20	38	54	34	26	36	10	meaſles, influenza.
91	21	41	41	30	12	20	6	ſome fevers, but no epidemc.
92	15	41	23	24	11	37	8	
93	29	65	80	35	12	40	10	angina, fevers.
94	54	109	56	28	50	47	19	angina, fevers.
95	55	88	35	16	38	34	9	fevers.
96	19	75	40	35	8	42	15	meaſles in many places.
97	25	59	40	25	14	18	8	health in general.

From the bills of mortality and preceding hiſtory may be deduced ſome intereſting obſervations.

1. We obſerve an order and progreſſion in the epidemics, which is in a degree uniform. Periods of peſtilence, with ſome exceptions, ſeem to be introduced by meaſles and influenza; then follow diſeaſes of the throat, or anginas; laſtly peſtilential fevers. During the whole period, the meaſles, influenza and angina, occaſionally appear in ſpring, autumn and winter; and rarely, if ever, does a peſtilential fever, as plague and yellow fever, occur in a particular city or country, without influenza, angina, meaſles or inflammatory fevers in the ſpring preceding, for immediate precurſors. This is true in the tropical climates, in caſes of epidemics; and ſo uniform has been the fact in the temperate latitudes, that I am nearly prepared to ſay, that if none of thoſe precurſors appear in winter and ſpring, no peſtilential fever will be epidemic in the following ſummer and autumn, unleſs the dyſentery may be excepted. It holds true in every caſe of *great* peſtilence.

2. The progreſſiveneſs in the peſtilential principle is obvious in the augmented bills of mortality, which immediately precede the plague. This ariſes from the number and violence of the malignant diſeaſes which always precede an epidemic peſtilence. This augmentation is viſible ſome times two years before the plague appears, and almoſt always in the ſpring months preceding. See the London bills in the years preceding the plague in 1625—1636—1665. The ſame is obſervable in other bills, both in Europe and America. In a few inſtances, the bill of the preceding year is low; but in this caſe, ſome other epidemic has uſually gone before, and finiſhed its courſe; or the plague is preceded by influenza only, which does not ſwell the bill of mortality.

3. Sometimes a ſeries of epidemics falls with more violence on one hemiſphere than on the other; but perhaps in no inſtance has a courſe of diſeaſes ſpread over one continent, without ſhowing themſelves on the other. I have not been able to find an inſtance in which the plague has made great ravages in the eaſt, except when the American continent has been more or leſs affected by the epidemics above mentioned; and in ſome inſtances it is proved that the violence of the ſore-throat, influenza, meaſles or

yellow fever, in America, has correſponded with the violence of peſtilence in Egypt and the Levant. The commencement of each period of epidemics is nearly cotemporary, in both hemiſpheres.*

Thus the great plague in Conſtantinople was cotemporary with the fatal angina and dyſentery in America in 1751—alſo in 1755. Cotemporary with the meaſles in America in 1758 and 9, was the commencement of the extenſive Levant plague of 1760. Peſtilence in Perſia was cotemporary with the epidemics of 1773—In 1783 commenced plague in the eaſt and epidemics in America—the ſame in 1792 and 3. Diſeaſes of the throat in almoſt every inſtance prevail at the ſame time in Europe and America.

4. In two periods within half a century, a ſevere angina and dyſentery have been epidemic together and once for a ſeries of years, as in 1751, and from 1773 to 1777. This is an exception to the uſual order, and other deviations ſometimes occur.

5. As catarrh precedes, ſo it follows every ſevere epidemic peſtilence, and the perſons who have been affected with a peſtilential fever in ſummer, are moſt apt to be affected by catarrh at the commencement of cold weather.

6. After ſevere peſtilential fevers in ſummer, the inflammatory fevers of winter, wear the livery of the ſummer fevers. They generally carry with them bilious diſcharges, and a yellow ſkin. They have alſo this remarkable character, that they ſpeedily run through the inflammatory diatheſis, and become typhus. They are the *peſtilence of winter* ; and ſometimes appear *before* the peſtilence of ſummer. This fact alone decides the queſtion, that peſtilential fevers of ſummer are generated on the ſpot where they exiſt ; and derive their malignant and infectious quality ſolely from the ſtate of the elements.

This ſpecies of inflammatory fever has occurred in many caſes during the winter months, ſince the year 1790. In ſome caſes it has extinguiſhed three, four and five members of a family ; as in Hartford and New-Haven. But it is a moſt conſoling reflection, that it is leſs frequent than formerly in this country. It has not been epidemic in the northern ſtates ſince 1761, as far as I can learn. Formerly it was as frightful a calamity as the yellow fever is in this age. In the foregoing hiſtory, many examples have been mentioned—as at Fairfield in 1698—at Waterbury in 1713—at Hartford and Duck Creek in 1720—at Farmington in 1729—at Bethlem, Hartford, Eaſt-Haven and New-Haven in 1761—at Holliſton in 1753, &c. Whether the diſappearance of this diſeaſe is owing to the clearing of the country, by which the quantity of debilitating miaſmata of ſummer has been diminiſhed, or whether it is the conſequence of other alterations in our climate, is not eaſily determined.

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* It ſometimes happens that peſtilence occurs in Conſtantinople, Smyrna or Cairo, when it is not epidemic beyond thoſe cities ; owing to peculiar ſeaſons and local cauſes. But it never ſpreads to Syria, the iſlands of the Archipelago, and other neighboring countries, except when epidemic diſeaſes ſpread over the world. At leaſt I have not found an inſtance.

The diſappearance of the Long Fever, ſo called, is another moſt conſoling circumſtance. This ſpecies of typhus fever was formerly one of the moſt terrible diſeaſes of our climate. At preſent it is a rare occurrence.

On the whole, we have very clear proof that the *quantity of diſeaſe* in this country, has been diminiſhed, within half a century. The yellow fever, that is, the peſtilential fever of ſummer and autumn, was formerly as frequent and as malignant as in this age; while the inflammatory fevers of winter, and the long fever, have almoſt diſappeared as epidemics. The intermittents and remittents of autumn, are greatly decreaſed in the northern ſtates; and the dyſentery has not increaſed in frequency or virulence. Anginas have never been ſo fatal as they were between 1735 and 1743.

It is probable that ſome of theſe changes in the character of diſeaſes may be aſcribed to alterations in our climate, or modes of living—and therefore may be permanent. In ſome caſes, improvements in medical ſcience and the practice of phyſic may have diſarmed diſeaſes of their terrors. But it is poſſible that ſome of the changes mentioned are only revolutions in diſeaſe, occaſioned by temporary cauſes, and that the ſame diſorders may, in future periods, recur, with the whole train of formidable ſymptoms.

Note.—It has been obſerved that the *long fever,* ſo called, has nearly diſappeared from our climate. On further enquiry, it appears that this obſervation muſt be reſtricted to the maritime ſtates. The bilious remitting fever that prevailed in Vermont and New-Hampſhire in 1798, and which has re-appeared in this ſummer (1799) is of that ſpecies. See Medical Repoſitory, vol. 3. 5. In the *interior* of our country, this is a new diſeaſe; while on the ſea-coaſt it has become extinct. Shall we conclude from theſe facts, that the diſeaſe follows or ſprings from a particular ſtate of cultivation? In the interior, where the diſeaſe is now prevalent, the clearing and cultivation of the country were begun about 30 years ago. On the ſea-coaſt, where the diſeaſe has diſappeared, the country has been ſettled 150 years, and is generally under cultivation.

SECTION XII.

Of the Influenza, or Epidemic Catarrh.

AS the catarrh appears to be the diſeaſe which is moſt cloſely connected with peſtilence, and the leaſt dependent on local cauſes or the ſenſible qualities of the air, I have collected all the well-defined inſtances of this epidemic which have occurred to my reſearches, and arranged them in chronological order ; placing againſt the year the moſt remarkable phyſical occurrences, and mentioning thoſe which fell within the years next preceding and following :

A. D. CATARRH EPIDEMIC IN

1174, the year *before* an eruption of Etna, and followed by great mortality. [Chaſm in the accounts of this diſeaſe.]

1510, the *ſame* year with an eruption in Iceland, and following great earthquakes. Humid air—a comet appeared the next year. [Chaſm.]

1551, the year *after* an eruption of Etna, and a comet. Seaſon wet.

1557, the year *after* an eruption of Etna. Seaſon moſtly wet; but in ſome countries dry ; a comet the ſame year. [Chaſ.]

1580, the year *after* an eruption of Etna. Cool dry north wind —A comet.

1587, the *ſame* year with an eruption in Iceland—and *after* a comet.

1591, *after* earthquakes in 1590, and a comet.

1597, the year *after* earthquakes and a hard winter ; rainy ſeaſon, and a comet the ſame year.

1602, the year *after* earthquakes, volcano and ſevere winter. Cold and wet ſeaſon.

1610, the year *after* an eruption of Etna, a comet and ſevere winter. Seaſon very hot and dry. [Chaſm.]

1647, Firſt catarrh mentioned in American annals. The ſame year with violent earthquakes in South-America. A comet.

1650, In Europe the *ſame* year, with an eruption of Etna and earthquakes.

1655, in America, ſame year with violent earthquakes in South-America, and eruption of Veſuvius.

1658, in Europe, after a ſevere winter ; ſummer cool.

1675, in Europe, *while* Etna was in a ſtate of exploſion ; mild winter.

1679, 80, in Europe, *during* or juſt after the eruption of Etna ; wet ſeaſon and a comet.

1688, in Europe, *ſame* year with an eruption of Veſuvius, after a ſevere winter and earthquakes ; this began in a hot ſummer.

1693, in Europe, *ſame* year with an eruption in Iceland, and great earthquakes ; cool ſeaſon.

1697, 8, in America, after a great earthquake in Peru ; a comet the ſame year, and ſevere winter.

1699, in Europe, in ſpring ; great earthquakes the ſame year, and a comet.

1708, 9, in Europe, in a ſevere winter, *after* a comet and volcano.

1712, in Europe, the *ſame* year with an eruption of Veſuvius and a comet ; wet ſeaſon.

1717, in Europe, the *year* of a comet, eruption of Veſuvius, and a ſevere winter.

1729, 30, in Europe, the *ſame* year with an eruption in Iceland and Veſuvius ; dry ſummer ; a comet.

1733, univerſal, after a comet, a ſevere winter and great earthquakes.

1737, in Europe and America ; an eruption of Veſuvius, great earthquakes and a comet.

1743, in Europe, violent earthquakes.

1744, a comet ; earthquakes.

1747, in America and Europe, with a comet and eruption of Etna.

1755, in Europe, with violent earthquakes and eruptions of volcanoes, and ſevere winter.

1757, in America, ſoon *after* a comet, and followed by an earthquake.

1758, in Europe, followed by earthquakes the next year.

1761, in America ; an earthquake during its prevalence.

1762, in Europe, *before* an eruption of Etna ; a comet the ſame year.

1767, in Europe ; an eruption of Veſuvius the *ſame* year, and of Etna and Heckla in the preceding year, with a comet and earthquakes.

1772, in America, *after* an eruption of Veſuvius and Heckla, and a ſevere winter.

1775, in Europe, preceded by earthquakes, ſmall eruption of Lipari the ſame year, and in New-Spain.

1781, in America, the year *after* an eruption of Etna, and a moſt rigorous winter.

1782, in Europe and Aſia, the year *before* the great eruption of Heckla.

1788, in Europe, ſoon after eruptions of Veſuvius and Etna, and earthquakes.

1789, in America, with an eruption of Veſuvius, juſt *after* a great earthquake at Iceland and in Europe ; warm ſummer ; mild winter followed.

1790, in America, after a mild winter.

1795, in England, *after* an eruption of Veſuvius and a ſevere winter.

1797, in Europe, *after* earthquakes ; a comet the ſame year.

The accounts of the ſeaſons are moſtly from Engliſh writers, and refer to England, with ſome exceptions. In regard to heat and cold, the ſeaſons are generally uniform in moſt countries, on the ſame continent ; but not in regard to drouth and moiſture.

Of theſe forty-four inſtances of influenza, it may be obſerved, from the preceding hiſtory,

1. That moſt of them happened, after or during ſevere cold, or during moiſt weather, and in ſpring, winter or autumn. Some however, occurred in dry hot ſeaſons, and others in mild winters.

2. Nineteen inſtances occurred in years when there was a volcanic eruption in Italy or Iceland, and eleven others, though in different years, were within a few months of eruptions; making 30 out of the 44. Two or three others happened near the time of volcanic diſcharges in South-America.

3. Almoſt all happened in years of earthquakes, or within a few months preceding or following them.

4. Thirty inſtances occurred within the year, or a few months preceding or following the appearance of comets.

It is further to be obſerved that ſome of theſe epidemics have been limited to the American hemiſphere, at the diſtance of three, four or five years from an epidemic of the ſame kind in Europe. Such as thoſe of 1647—1655—which coincide in time with violent earthquakes in South-America.

In other inſtances this diſeaſe ſpread over the whole globe; uſually beginning in America: That is, in the inſtances of which I can obtain any correct information. Thus in four inſtances, viz. in 1698, 1757, 1761 and 1781, it ſpread over the American hemiſphere one year prior to its pervading the other hemiſphere. And the univerſal catarrh of 1733, which encircled the globe, commenced in America two months before it appeared in Europe. The epidemic of 1782 invaded Europe from the ſide of Aſia, the year after it appeared in America. In 1788, the influenza in Europe *preceded* the ſame diſeaſe in America.

I regret my want of materials to complete a view of this ſubject. No regular regiſter has been kept in America, of the ſeaſons, diſeaſes and phenomena, from the firſt ſettlement, and whether any notices of all the catarrhs in this country, are in exiſtence, I do not know. I have found no account of any, between 1655 and 1698—nor between the latter year and 1733. One of theſe inſtances, that in 1698, came to my knowledge by accident, as I have mentioned under that year, in the foregoing hiſtory. From the uniform appearance of this epidemic as often as once in ten or twelve years, in other periods, we have ground to believe, it has always occurred in nearly the ſame periods.

This epidemic is evidently the effect of ſome inſenſible qualities of the atmoſphere ; as it ſpreads with aſtoniſhing rapidity over land and ſea, uncontrolled by heat or cold, drouth or moiſture. From theſe circumſtances and its near coincidence in time with the violent action of fire in earthquakes and volcanoes, there is reaſon to conclude the diſeaſe to be the effect of ſome acceſs of ſtimulant powers to the atmoſphere by means of the electrical principle. No other principle in creation, which has yet come under the cognizance of the human mind, ſeems adequate to the ſame effects. I do not conſider earthquakes and volcanic eruptions as the *cauſes* of this epidemic, but as effects of the common cauſe and evidences of its exiſtence.

The courſes of this epidemic are very various. That in 1510 proceeded from Africa to Sicily, Italy and the north of Europe. This diſeaſe could not be the effect of the eruption in Iceland ; for it appeared firſt in ſouthern latitudes. If there was a volcanic diſcharge about that time in Africa, we might be inclined to aſcribe the diſeaſe to that cauſe ; but it is more probable that it is to be aſcribed to an inſenſible action of atmoſpheric fire,* which is more general and violent, about the time of eruptions ; and which fire is probably agitated in all parts of the globe, although it produces viſible effects in exploſions, in ſome particular places only. I think no man can queſtion the fact, after reading the preceding hiſtory.

The courſe of the epidemic in 1551, I am not able to aſcertain ; nor that in 1557. This invaded Spain in Auguſt.

The ſevere catarrh of 1580 began in the ſouth of Europe, in the heat of ſummer, and proceeded to the north. The ſeaſon in general was temperate.

From that year to 1708—9, I find no account of the courſe of the epidemic catarrh ; but that in 1708—9, began in the north of Europe and proceeded to the ſouth.

The epidemic of 1729—30, proceeded from Poland and Sileſia, to the weſt and ſouth, and ended about the time of an exploſion from Veſuvius.

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* I uſe this word to expreſs the principle manifeſted in electrical operations, although this is uſually ſuppoſed to be a cold fuſion. Of the nature of this principle, we know little. We ſee only its effects.

The univerſal influenza of 1733, began in America in the autumn of 1732. It appeared in Europe in December. That of 1788 appeared in April, May, June and Auguſt, in different places.

The epidemic in America in 1789, began in the middle ſtates, and ſpread ſouthward and eaſtward. In 1790, it began in about the ſame longitude, but in the interior country, and ſpread eaſtward and ſouthward.

The influenza of 1782 in Europe, came from Aſia. Poſſibly it might have travelled from America, acroſs the Pacific to China and Kamſchatka ; as it was epidemic in America in 1781.

This is all I am able to diſcover of the origin and direction of this ſingular epidemic. It is greatly to be deſired, that we might learn preciſely the dates of its appearance, the place, the direction of its progreſs, in all caſes, and compare theſe circumſtances with the extraordinary agitations of the elements, which occur about the ſame time. But for this purpoſe my materials are incomplete.

It is obſervable, however, that the influenza is cloſely allied to the meaſles. Sometimes the ſymptoms are combined in the ſame attack, and rarely does one diſeaſe become epidemic, except juſt before or after the other. This proves their alliance : indeed I conſider them as different modifications of the ſame epidemic.

Catarrh is alſo cloſely connected with peſtilential fevers, and ſometimes this is true of the meaſles. It is rare indeed that epidemic plague and yellow fever do not begin and end in catarrhal affections—that is, catarrh precedes in ſpring, and follows in autumn. Sometimes peſtilence is preceded and followed by meaſles and angina.

Every epidemic conſtitution ſeems to commence with meaſles or influenza. To theſe ſucceed angina, in ſome of its various forms, which are all the offspring of the ſame parent. Then follow peſtilential fevers, in the form of dyſentery, yellow fever and plague. Whenever the epidemic conſtitution is manifeſted by meaſles, influenza and affections of the throat, common diſeaſes, even in places apparently healthy, become more malignant, and ſporadic caſes of peſtilential fever occur in almoſt every ſituation.

Theſe facts are curious, and without attending to them, the philoſophy of epidemics cannot be underſtood.

P. S. After writing the foregoing hiſtory, I was able to aſcertain further particulars of a ſevere influenza in America in 1737. Warren, on the yellow fever, mentions this catarrh in Barbadoes in the winter preceding the bilious plague in that iſland in 1738. I have now learnt from two elderly gentlemen, who were then arrived to adult years, that in November 1737, this epidemic invaded all parts of the country, ſo ſuddenly and ſeverely that neighbors could not viſit each other, and that there were ſcarcely people in health to perform the ordinary domeſtic labors neceſſary to ſupport life.

If my informants are correct as to the time, this epidemic invaded Europe and America in the *ſame month*—the only inſtance that I have found; and an exception to the foregoing remarks. It will be obſerved alſo that this inſtance coincides with an eruption of Veſuvius, and the moſt tremendous tempeſt in the Eaſt-Indies ever known. Let it be noted alſo, that this catarrh was the *immediate precurſor* of the moſt fatal peſtilential fever in the Weſt-Indies, and one that nearly depopulated Mexico. The catarrh commenced with or a little before a moſt ſevere winter.

It is remarkable that the extent and violence of this diſtemper mark exactly the ſeverity of the peſtilential fevers which precede and follow it. The two epidemic catarrhs of 1733 and 37, invaded the whole globe in the ſame year. They were very ſevere, and ſo were the anginas and plagues of this period; far beyond what has occurred at any other time, during this century, until the laſt period.

SECTION XIII.

Of the order, connection and progreſſion of peſtilential epidemics.

IN the early periods of the world, little notice appears to have been taken of a connection between epidemic diſeaſes; nor have modern writers ſupplied this defect in the hiſtory of medicin. Hippocrates and Sydenham ſeem to have been aware of ſuch a connection, and the latter author has laid a broad and firm foundation for a complete ſyſtem of truth, on the ſubject of epidemics. His obſervations were confined to the city of London. Had he extended his view to all parts of Europe, and generalized his obſervations, he would have found a multitude of facts to juſtify his theory, and probably would have raiſed it above the reach of that obloquy and ridicule, which ſucceeding profeſſors of phyſic, of leſs genius and learning, have caſt on his occult qualities of air.

Indeed, it is ſurpriſing that medical men have not purſued the ideas ſuggeſted by theſe great fathers of their ſcience. Hippocrates led the way, unlocking the great doctrin of a conſtitution or ſtate of the atmoſphere, calculated to produce particular epidemic diſeaſes; a doctrin which Sydenham has purſued with wonderful ſucceſs. Any man who reads the hiſtory of diſeaſes, muſt ſee that certain ſpecies of them appear nearly together in time and place. The order in which they appear, may not be exactly the ſame at all times, and in all countries; but they occur ſo nearly together, as evidently to prove their alliance, and their dependence on the ſame general cauſes.

All popular diſeaſes muſt have, for their cauſes, ſome principles as extenſive as the effects. Theſe cauſes moſt probably exiſt in the elements, fire, air and water; for we know of no other medium by which diſeaſes can be communicated to whole communities of people.

Bad food indeed is a fruitful ſource of diſeaſes ; but this muſt always proceed from the qualities of the elements which enter into its compoſition. A defect therefore in the nouriſhing powers of food, is a conſequence of a defect or ſuperabundance in the elements, or in their combination in animal and vegetable productions. It may be conſidered as a diſeaſe in the animal and vegetable kingdom, which moſt probably proceeds from the ſame cauſes, as epidemic diſtempers among mankind.

The principal epidemic diſtempers which invade mankind, are, catarrh or influenza, meaſles, whooping or chin cough, the different ſpecies of angina, ſmall pox, bilious fevers, petechial fever, dyſentery, plague. Of theſe, catarrh is the moſt decidedly an epidemic dependent wholly on a particular ſtate of atmoſphere. Cullen calls it " catarrh from contagion," to diſtinguiſh it from ſporadic caſes of the ſame diſeaſe ; but, after careful obſervation, during the progreſs of it in the United States in 1789, and again in 1790, I am confident the progreſs of the diſeaſe depends very little on a communication from perſon to perſon. It has been doubted whether it is an infectious diſeaſe ; and I have ſome evidence to prove it not ſo ; but certain it is, that its ſudden invaſion of whole families, whole towns and even whole countries, and the rapidity of its progreſs over ſea and land, abſolutely preclude the ſuppoſition of its dependence on ſpecific contagion.

The other diſeaſes above enumerated may ariſe from both cauſes—infection and a peculiar ſtate of air. Some of them depend moſtly on a conſtitution of air, fitted to produce them ; others are ſeldom produced without a connection with diſeaſed perſons. It is however proper to obſerve that the ſmall-pox, dyſentery and plague are not uſually, and in ſtrictneſs of language, *epidemic* diſeaſes. They ſeldom invade whole countries. They are more properly *endemic ;* yet this epithet is not ſtrictly applicable to them ; being uſed more properly to denote a diſeaſe which is *peculiar* to a particular place, whereas thoſe diſeaſes may invade any place on the globe. The elephantioſis is an *endemic* in Egypt and certain other places in warm climates ; the ſmall-pox, dyſentery and plague uſually appear in cities, camps, or other unhealthy ſituations, without affecting neighboring places, which contain not the ſame local cauſes of diſeaſe. They might therefore, in ſtrict propriety, be denominated *temporary endemics*, in oppoſition to *epidemics* which ſpread to all places alike ; and to *endemics*, which *conſtantly* or *uſually* appear in particular parts of the world.

This diſtinction however is not very material ; and I ſhall therefore ſpeak of the ſmall-pox, dyſentery and plague, as epidemic diſeaſes ; meaning by this epithet, that they, at certain times, ſpread generally over a particular town or region.

The nature and kinds of contagion will be more particularly conſidered, in a ſubſequent ſection ; the preſent ſubject, is, the order, connection, and progreſſion obſervable in peſtilential epidemics.

The influence of a certain ſtate of air in generating epidemics was obſerved by Hippocrates, who has deſcribed the prevalent diſeaſes, in different ſeaſons. In his ſecond ſection on epidemics, he deſcribes what he calls " Kataſtaſis loimodes," a peſtilential ſtate of the air or ſeaſons. He does not indeed in this paſſage mention the *plague*, but he ſpeaks of thoſe malignant diſeaſes which are, in modern times, the precurſors of the plague, and which are now produced by the ſtate of weather which he deſcribes.

This ſtate of the ſeaſons he repreſents thus, " The year was auſtrinus, remarkable for ſoutherly breezes, rainy and without winds. The firſt part of the year dry, and autumn rainy, with ſoutherly winds, humid and cloudy. In winter, ſoutherly winds, moiſt and mild weather. About the vernal equinox, ſevere cold, but the north winds, with ſnow, were of no long duration. Spring was again calm, ſoutherly weather—great rains continued till Auguſt—then clear hot weather—the cool Eleſian winds blew but little and for ſhort periods. A rainy autumn, with north winds."

The ſoutherly, hot, humid air here deſcribed, whenever of long continuance in ſummer, proves the cauſe of numerous malignant diſeaſes, in the United States, as well as in Europe, altho not certainly productive of peſtilence.

Hippocrates proceeds to mention the diſeaſes which prevailed in this ſtate of ſeaſons. "Before ſpring, even during the cold weather, appeared many eryſipelous diſeaſes of a malignant type. Diſeaſes of the fauces, accompanied with hoarſeneſs, ardent fevers, with phrenitis; ulcers in the mouth; inflammation of eyes, carbuncles, &c. Theſe diſeaſes ſpread and became epidemic and mortal." The author then proceeds to deſcribe the eryſipelas and other diſeaſes here named. Theſe caſes differ from the plague in Athens; and prove that the peſtilence in Thaſus, where he wrote, was of milder ſymptoms, though probably cotemporary with that epidemic in Athens.

My particular reaſon for reciting theſe paſſages from Hippocrates, is, to prove a progreſſiveneſs in a peſtilential ſtate of air, and the diſeaſes which it produces. The diſeaſes here mentioned are the ſame, ſubſtantially, as thoſe which *precede* the plague in modern times, in the countries bordering on the Mediterranean, and with little variation, the ſame with thoſe which precede the plague in all parts of the world. Eryſipelous, or other eruptive diſeaſes, catarrhous affections, or ardent fevers, are the conſtant precurſors of the plague, wherever it appears. Hippocrates does not mention any fatal plague, in the ſtate of air deſcribed; and it often happens, at this day, that the ſtrength of the peſtilential principle is arreſted in its progreſs, and the epidemics are limited, in their violence, to diſeaſes of a type leſs malignant than the true plague, or ariſing to the plague only in a few ſcattering caſes. But whatever may be the degree of the peſtilential ſtate of the air, or at whatever point, it may be deſtined to ceaſe, and yield to a more ſalubrious conſtitution, the claſs of diſeaſes which mark its riſe and progreſs, are always ſimilar, or the ſame, modified only in the violence of their ſymptoms, by accidental circumſtances.

A careful attention to theſe facts, cannot fail to convince the obſerver of the juſtneſs of Sydenham's doctrines, in regard to conſtitutions of air; and the facts themſelves demoliſh, at one ſtroke, all the common medical doctrines of the communication of peſtilence from place to place by contagion, or fomites.

Unfortunately, the hiſtories of ancient plagues furniſh but little light on this ſubject; yet the barren annals of antiquity and the middle ages, are not wholly deſtitute of evidence to this point. The progreſſion of the plague in Rome, growing more general and fatal to the ſecond and third year, is a fact recorded by Livy, and is related in the preceding pages.

The remark of Dion Caſſius, that the aſhes from Veſuvius, in the great eruption of 79, produced, that year, only ſlight diſeaſes, but the next year, an epidemic, has already been noticed. It leaves no room to queſtion, that the deſtructive plague of the year 80, was preceded by epidemic diſorders of a leſs malignant type.

The middle ages furniſh facts in confirmation of this doctrin. Witneſs the great plague in 1112, which was preceded by eryſipelous diſeaſes in England in 1109, and great mortality in 1111. The plague of 1242, which was preceded by great mortality in 1240—the ſame fact is obſervable in the peſtilence of 1252, 1368, 1379, 1390, 1517, 1527, 1575, 1636—and in many other inſtances.

This fact did not eſcape the notice of that accurate obſerver of nature, Lord Bacon, who lived at a period when the plague frequently infeſted England. He ſays, "The leſſer infections of the ſmall-pox, purple fever, agues, &c. in the preceding ſummer, and hovering all the winter, *portend a great peſtilence the following ſummer*, for putrefaction riſes not to its height at once." Works, vol. 3, p. 59.

That ſtate of air which produces peſtilential diſeaſes, Lord Bacon denominates *putrefaction;* but whatever appellation we may give to the *cauſe* of peſtilence, the remark is demonſtrably well founded, that this "riſes not to its height at once." It is progreſſive; producing firſt the "leſſer infections." The plague is rarely, if ever, an original, diſtinct, iſolated diſeaſe; but the laſt or moſt mortal form of a ſeries of malignant diſtempers. The *purple* fever mentioned by Lord Bacon is nearly allied to the *petechial* fever, which is the uſual precurſor of peſtilence in the Levant.

The univerſal plague of 1635, 6 and 7, was preceded by the uſual diſeaſes, and the progreſs of them is diſtinctly traced by the learned Diemerbroeck. He remarks, chap. 3 de peſte, that "the ſpring of 1635, was warm and moderately humid, to which ſucceeded a very hot, dry ſeaſon, in which appeared many malignant epidemics. In the firſt place, a ſevere plague broke out at Leyden, and deſtroyed more than 20,000 lives. At Nimeguen, in Gueldres and other regions, a certain peſtilent fever ſpread with dreadful mortality. In autumn, the ſevere heat ſtill continuing with exceſſive drouth, many other malignant diſeaſes appeared, as ſmall-pox, meaſles, diarrhea and dyſentery of a very bad type ; but above all, the above mentioned peſtilential purple fever, called in Italy *petechial*, increaſed daily in extent and violence, *until it turned into the true plague*—" donec tandem in apertiſſimam peſtem tranſiret."—The author goes on to remark that from November through the winter, ſcattering caſes of plague occurred in Nimeguen. In January 1636, it increaſed, and in March ſpread and became epidemic—roſe to its height in April, and continued till October. See pages 5 and 6.

This paſſage contains a number of important facts. Firſt—the ſeaſons were inſalubrious. Secondly—the peſtilential ſtate of air extended to many places at the ſame time : In another page, the author ſays the peſtilence ſpread over almoſt all Germany and the low countries. Thrdly—this ſtate of air was of different degrees of malignity or violence, in different places at the ſame time. Thus, the plague appeared at Leyden early in 1635, but cotemporary with this, was the appearance of the purple fever in Nimeguen and in other places ; and during the ſummer and autumn, this and other epidemics continued to rage with great mortality, and at laſt, the ſtrength of the peſtilential principle increaſing, the fever changed its form, and appeared in the true plague.

Now, the modern way of accounting for the plague in Nimeguen, would be to *allege* or *ſuppoſe* ſome infected goods to have conveyed the contagion from Leyden, where it firſt appeared ; and then to *ſuppoſe* the infection to be carried to Leyden from the Levant.

The philoſophic Diemerbroeck, who was preſent and obſerved all the circumſtances, *ſuppoſes* nothing. He relates plain facts juſt as they occurred, and admits that the plague muſt have originated in the country.

By conſidering the malignant epidemics that prevailed at that time, as connected and depending on the ſame general cauſe, we ſolve all the difficulties attending the origin of the plague. The petechial fever, which appeared at Nimeguen and other places, in 1635, was *one of the forms* in which the general contagion of the period, exhibited its effects on the human conſtitution. It was a *part* of the peſtilence—it could not be conveyed from Leyden, for it appeared in moſt parts of the low countries and in Germany, at the ſame time. The ſame general cauſe, an indiſpoſition in the elements to ſupport healthy life, produced various peſtilential diſeaſes, according to place, ſeaſon, age, habit of body and conſtitution, until its ſtrength and violence aroſe to their height, and gradually introduced the worſt form of peſtilence.

The idea of Diemerbroeck, that the purple fever "turned to the plague," muſt give great offence to the followers of Mead and Cullen, the advocates for the doctrin of the propagation of the plague ſolely by ſpecific contagion. It oppoſes efficaciouſly their whole theory, and levels it with the earth.

The fact is however indiſputable. In the diſtreſſing period from 1569 to 1577, when Europe was almoſt depopulated by the ſpotted fever, phyſicians obſerved that this diſeaſe frequently turned into the plague, and the plague into the ſpotted fever. The ſame fact was often noticed by writers of the 16th and 17th centuries, in which the plague frequently overran Europe.—Theſe two diſeaſes, are therefore two diſtinct forms or modifications of peſtilence—probably bearing an affinity to each other, like that between the diſtinct and confluent ſmall-pox. This fact ſhows that the diſtinction made by medical writers, between *peſtis* and *peſtilentia*, the plague and other peſtilential diſtempers, however uſeful in practice, is not authorized by truth and philoſophy. The ancients claſſed all contagious epidemics together, and denominated them *peſtilence;* and this diſtribution, in regard to their cauſes and origin, was doubtleſs moſt philoſophical. The diſtribution made by modern phyſicians, ſeems to have ariſen out of differences of ſymptoms, and to be beſt adapted to practice. At the ſame time, it has probably been the occaſion of the common error of conſidering different ſpecies or forms of peſtilence, as diſeaſes of generical difference, and proceeding wholly from diſtinct cauſes, when in fact they all have *one general cauſe* in common, and the varieties of their ſymptoms proceed from *diſtinct local* and *temporary cauſes.*

On this ſubject the learned Riverius, in his Praxeos Medicæ, lib. 17. has many judicious remarks. He obſerves, " That authors, who wrote on fevers, diſtinguiſh a peſtilent from a malignant fever—by peſtilent fever they underſtand the true plague ; by a malignant one, the fever vulgarly called *purple*, or other fever, which tho epidemic and contagious, is leſs dangerous, and in which more patients ſurvive than periſh—whereas the eſſence of the true plague conſiſts in this, that it deſtroys more than half who are ſeized with it." He however conſiders theſe fevers as differing moſtly in degree of malignity, and therefore treats of them under one head.

A peſtilent fever this author conſiders as not proceeding ſolely from intemperate heat, or putridity ; but from a malignant and poiſonous quality ; and whenever this quality appears in a fever, whether quotidian, hectic or putrid, he thinks it ought to be denominated *peſtilent.* A peſtilent fever differs from the plague as ſpecies from genus becauſe there may be plague without fever.

This author remarks alſo the connection between certain epidemics. " Many deadly diſeaſes accompany the prevalence of peſtilence—as phrenitis, anginas, pleuriſies, peripneumonies, inflamations of the liver, dyſenteries and many others." He aſcribes epidemics to the ſtate of air, as a common cauſe, to which he adds the uſual local or particular cauſes, which modify its influence.

Proſper Alpinus informs us that theſe diſeaſes prevail alſo in Egypt, at certain times ; but he gives no account of their order or connection. Vol. 2. p. 73.

Bellinus deſcribes the phenomena which precede the plague, which he calls its *antecedents.* After mentioning food of a bad quality, impure air from exhalations, intemperate ſeaſons, vapours emitted during earthquakes and the like, he ſays, " Mox autem invaſuram antecedunt morbi epidemici, qui cujuscunque generis eſſe poſſunt, febres petechiales, variolæ, morbilli, dyſenteriæ, pleuritides epidemicæ." De febribus, page 265.

This author does not here ſpeak of theſe antecedents as *unuſual* phenomena ; but lays it down as a general fact, that ſpotted fevers, ſmall-pox, meaſles, &c. become epidemic, juſt before the invaſion of the plague.

Van Helmont obſerves that " he could never perceive a different pulſe in the plague, from that in continual malignant fevers." p. 1138—no inconſiderable authority for the identity of the diſeaſes in kind, however various in degree.

The great Sydenham took notice of the unuſual prevalence of malignant diſtempers, juſt before the plague of 1665 In vol. 1, p. 122, he ſays, " I never knew pleuriſies, quinſies and other inflammatory diſeaſes, more common than they were for ſome weeks preceding the plague in London in 1665." Theſe were the hybernal and vernal precurſors of peſtilence. As the ſeaſon advanced and the weather became mild, theſe inflammatory diſeaſes yielded to a malignant fever, deſcribed by the ſame author, and already mentioned in the preceding hiſtory, which was the immediate precurſor of the true form of the plague, into which it changed by ſuch inſenſible degrees, that Sydenham himſelf was at a loſs to determin whether that fever was the plague or not, and was candid enough to acknowledge his ignorance. And as a further proof that this fever and the plague were only different forms of the ſame diſeaſe, we muſt notice the fact recorded by Sydenham, that when the plague in autumn began to abate, the ſame malignant fever re-appeared—ſee page 136 : that is, the diſeaſe, by change of ſeaſons, began to loſe its glandular marks, and gradually to aſſume a leſs malignant type. Hodges mentions the ſame fact, and ſo does Morton.

In every inſtance of a ſevere plague, of which I can obtain a tolerably correct hiſtory, the diſeaſe has paſſed through a ſimilar progreſſion, and exhibited ſimilar facts.

Thus in 1719, the year before the great plague in Marſeilles, appeared a peſtilential fever in that city, which, in ſome caſes, produced buboes and carbuncles. That is, the plague actually began to appear, ſix months before the arrival of the infection from Syria !

In Aleppo, the plague which appeared in 1742, was *preceded* by an acute fever ; and after the diſeaſe abated in July, appeared diarrheas and dyſentery of a malignant type, attended in many caſes with petechæ, and intermittents which often proved fatal. Theſe diſeaſes, in their acute forms, prevailed alſo with the plague, which in this year was not ſevere, nor wholly the predominant epidemic.

This continued acute fever and pleuriſies, ran through the winter. In November appeared a few caſes of the plague. Where the *infection* had lain dormant from July to November, the author of this account, Alexander Ruſſell, has not informed us.

In the ſpring of 1743, the plague again appeared and ſpread in the city, and at the uſual time in ſummer ſubſided, being again ſucceeded by other acute diſorders, which by bleeding and purging, were formed into tertians, double tertians and quotidians.

Here again we have the ſame progreſſion in the ſtate of the peſtilence, which had been remarked by Hippocrates, Bacon and Sydenham. During the exiſtence of this peſtilential conſtitution in Aleppo, all the ordinary diſeaſes of the country aſſumed a more malignant type ; or as Sydenham remarked of the diſeaſes which preceded the plague of 1665, they " differed from the ſame diſeaſes in other years, by new and unuſual ſymptoms, which in ſhort amounted to this, that they were all *more violent.*" See vol. 1, p. 20.

The diſeaſes changed their form with the ſeaſons—the acute fever preceding ran into plague, and plague ran into malignant dyſentery, tertians, and other acute diſtempers.

Similar facts are obſerved in America. The plague has been preceded by acute diſeaſes, as anginas, remittents of a bad type, &c. and followed by remittents, dyſentery and malignant pleuriſy.

The dreadful plague at Meſſina in 1743, which deſtroyed two thirds of its inhabitants, was introduced by a malignant fever. One phyſician alone out of thirty-three, pronounced it the plague ; the others denied it, becauſe the diſeaſe was not attended with glandular ſwellings.

A ſimilar fever preceded the ſevere plague at Venice in 1576, and the ſame uncertainty at firſt embarraſſed the phyſicians and magiſtracy.

The terrible peſtilence at Naples in 1656, was announced by the uſual herald of the diſeaſe, a malignant fever. One phyſician alone pronounced it the plague, and for his audacity was impriſoned by the Viceroy.

The extenſive peſtilence which ſpread over all the Levant countries and iſlands, from 1759 to 1763, was every where preceded by a ſimilar increaſe of malignant diſeaſes, and eſpecially by the petechial fever, which appeared, at Aleppo, in the year next previous to the plague. Yet the author of this account, Patrick Ruſſel, labors very gravely to trace the diſeaſe to Turks from Egypt and their old clothes.

The uncertainty among phyſicians, at the commencement of a plague, with reſpect to the nature of the diſorder, is a ſtrong proof of the doctrin for which I contend. Van Helmont, Diemerbroeck and others have found it neceſſary to lay down rules with a great degree of care and caution, to enable themſelves to determin, whether a malignant diſeaſe is the plague or not. Van Helmont obſerves, p. 1138 that he could perceive no difference in the pulſe, in plague and continual fevers of the malignant kind—that buboes in the groin, paroitides, &c. are not unfrequently found in fevers free from plague; and ſometimes ſpots and carbuncles. But, ſays he, if many of theſe appearances do concur, there is no difficulty in pronouncing it the plague, eſpecially if they appear before or early after the fever.

Diemerbroeck declares, that no one ſymptom determines a diſeaſe to be the plague—neither fever, buboes nor carbuncles are eſſential to that diſeaſe, for it often paſſes off without either—many of its ſymptoms are common to that and other diſtempers—the exiſtence of the diſeaſe therefore is to be determined by a view of all the circumſtances, and one criterion, he remarks, is, the prevalence of the plague in neighboring towns.

This laſt remark indicates that the author had obſerved the exiſtence of peſtilence in various places at the ſame time, to be a common event.

The difficulty at firſt in aſcertaining the exiſtence of the plague, proceeds wholly from the progreſſion in the ſeries of diſeaſes—the malignant fevers, preceding gradually increaſing in violence, and changing their form.

It has been the ſame in the United States. The firſt caſes of the bilious plague have occured early in ſummer, uſually in July, ſometimes in June. Theſe have not excited much alarm, for they have not uſually proved infectious; and they have therefore been claſſed among the ordinary diſeaſes of the hot ſeaſon. This however has ever been a miſtake; they were the leſs malignant forms of approaching peſtilence; yet five or ſix weeks after their appearance, when the epidemic has ſhowed itſelf in its formidable array, our citizents have hunted out ſome veſſel from ſouthern climates and palmed the evil on her ſeamen or cargo.

Van Swieten, Comment. vol. 16, 3. remarks, "that the plague has ſometimes lain concealed under the maſk of other diſeaſes. When the plague raged at Vienna in 1713, it frequently aſſumed the appearance of a pleuriſy, catarrh, or quinſy, but ſoon after, broke out buboes and carbuncles, moſt certain ſigns of the plague, accompanied with the uſual ſymptoms."

Here we obſerve the uſual precurſors and companions of the plague and the progreſſion of the peſtilential principle.

Hippocrates has remarked the augmented violence of diſeaſes, in particular periods. He ſays, "There are times when almoſt all the diſeaſes that occur, are extremely malignant, and in general, fatal, ſo that coughs, phthiſis, angina, are all equally mortal. He aſſures us, that the truth of his obſervations had been confirmed, in countries very different from each other, and in a variety of ſeaſons and climates." See the paſſage cited in Zimmerman on phyſic, p. 163.

We have multiplied proofs of the juſtneſs of theſe remarks. During the periods which I call *peſtilential*, the common diſeaſes of a country, as dyſentery, and intermittents, become more obſtinate and mortal; and even the pleuriſy and peripneumony, acquire unuſual violence. And it may not be improper to repeat an obſervation before made, that the malignant or epidemic pleuriſy never appears, except during theſe peſtilential periods.

It precedes or follows, in winter, ſpring or autumn, thoſe ſummers alone when peſtilence invades our cities. Such was the dreadful diſeaſe in America, in 1697-8—in 1761—and which has ſhowed itſelf, in ſeveral towns, during the preſent peſtilential conſtitution.

But a moſt ſatisfactory proof of the progreſſiveneſs in a peſtilential ſtate of air, and in the correſponding malignity of diſeaſes, is found in the bills of mortality. Thus, before the London plague in 1625, the bill of mortality roſe from 8 or 9000, the ſtandard of health, to 11,000 in 1623, and to 12,000 in 1624. The approach of peſtilence was clearly announced, two years before it appeared. And as the time of its appearance drew near, the extenſion or malignity of the preceding fevers was greatly augmented ; for in the year of the plague, almoſt nineteen thouſand perſons died of other diſeaſes than the plague. As the plague uſually prevails from June or July to November, and other diſeaſes are moſtly merged in it, almoſt all the deaths by common diſeaſes muſt have been in the beginning of the year, from January to June or July. Now, eighteen thouſand deaths in the ſix months preceding the plague, or even two thirds of the number, mark a prodigious increaſe of mortality—the *common ſign of approaching peſtilence.*

In the peſtilential period in London, from 1634 to 1636, the bill of mortality roſe two years previous to the plague.

The laſt great plague, in 1665, was announced by unuſual malignity in diſeaſes, four years before its appearance. In 1661, according to Sydenham, began a ſeries of epidemics, which greatly ſwelled the liſt of burials. There was however ſome abatement in 1663 ; but in 1664, and the firſt five months of 1665, the mortality again increaſed with rapidity, till a dreadful peſtilence laid waſte the city.

A ſimilar increaſe of mortality is obſervable in the bills for Augſburg, previous to the plague in 1628, and in 1635—in Dreſden, in 1632 and 3—in Philadelphia in 1793, in New-York in 1795, and in New-London in 1798.

It muſt however be obſerved, that the bills of mortality will not, in all caſes, exhibit the augmented number and malignancy of the diſeaſes which precede peſtilence ; for it ſometimes happens that the year next preceding the plague, is very healthy, and the malignancy in the diſtempers, which mark the beginning of the peſtilential ſtate, does not appear till the winter or ſpring previous to the plague. In this caſe, the augmented mortality falls within the year and the ſame bills, as the deaths by the plague. This was the caſe in Augſburg in the year 1535. In ſuch caſes, there is an interval between the preceding epidemics and the plague ; ſuch as we have obſerved in the New-England States, between the influenza and the ſcarlet fever, and the latter diſeaſe and the yellow fever.

Monthly bills will exhibit the progreſs of peſtilential epidemics, with more accuracy.

Fernelius remarks page 161, that " infection is to be perceived in the air, when it produces fevers not peſtilent, but which are at the threſhhold of peſtilence,"—plainly intimating that certain malignant diſeaſes precede the plague. He ſpeaks of the fact as general and well underſtood.

Even in the Weſt-Indies, the infectious yellow fever has its precurſors. That fever in Barbadoes, in 1738, was preceded by catarrh and ſuffocating cough in 1737 and ſpring of 1738. Yet authors pretend the diſeaſe to have been *imported* from Martinico !

See Warren and Short, vol. 2. 164.

The different modes in which peſtilence invades mankind, ſeem to depend on different cauſes. Sometimes, the principal cauſe ſeems to be an eſſential alteration in the inviſible properties of the elements ; in which caſe, the diſeaſes of a particular conſtitution, tho ſomewhat modified in their ſymptoms, are not controlled or arreſted by the ſeaſons. On the contrary the atmoſphere continues to be peſtilential, and to multiply diſorders of a malignant type, through every variety of ſeaſons and of weather. Thus, we obſerve many inſtances of violent plagues in the moſt pleaſant, and to all appearance, the moſt ſalubrious ſeaſons. Several inſtances have been mentioned in the preceding hiſtory, and we have demonſtration of the fact in the United States. The preſent peſtilential ſtate commenced with the meaſles and catarrh of 1789 and 90.—The ſummers of 1794 and of 1797 were apparently temperate and ſalubrious; yet in both theſe ſummers, the plague renewed its ravages in ſome towns, tho with leſs mortality than in the ſultry and unhealthy ſummers of 1793-95 and 98.

On the other hand, peſtilence ſometimes proceeds principally from exceſſively intemperate ſeaſons, as in ſevere heat, after a cold winter. In this caſe, the peſtilence may invade a city very ſuddenly and without a regular augmentation of mortality from previous diſeaſes. But even in this caſe, the plague has its precurſors, which appear at leaſt a few weeks, if not two or three months previous to its attack.

Thus the plague in Aleppo in 1742, firſt ſhowed itſelf in the ſuburbs in April; but was preceded by an acute fever in March. The bilious plague in Philadelphia in 1793, according to Dr. Ruſh, was preceded by the influenza, ſcarlatina and bilious remittents. The ſame diſeaſe in 1797 appeared, in ſcattering caſes, as early as June.

In New-York, the epidemic of 1795 was preceded by angina trachealis with anomalous ſymptoms, ſome caſes of obſtinate dyſentery, at a premature ſtage of ſummer, and by febrile complaints accompanied with bilious evacuations. At a meeting of the medical ſociety, early in July, theſe facts were mentioned, as denoting an uncommon ſtate of air, and the ſociety came to a reſolution, to make particular obſervations on the diſeaſes that might occur, before their next meeting. But, in the interval, the criſis of the peſtilence arrived, and removed all doubts.

See Dr. Baily on the epidemic of 1795, p. 55, and ſequel.

The ſevere peſtilence of the year 1798 doubtleſs owes its violence to a ſeries of moſt intemperate weather—moſt exceſſive heat, following a long and ſeverely cold winter. Yet this diſeaſe was preceded by premonitory ſigns, eſpecially catarrhal fevers. Of all the diſorders to which mankind are expoſed, none ſeem to indicate a peſtilential ſtate of air, with ſo much certainty as catarrhal affections. They almoſt always precede the plague—uſually accompany it, and ſometimes tread cloſe upon its heels.

In addition to the numerous authorities already cited, in proof of the progreſſion of peſtilence, let me mention Skenkius, who, in ſpeaking of the diſeaſes of 1564 and 5, obſerves, that anginas, pleuriſies and peripneumonies became epidemic; abortions were frequent, pains in the joints, ſmall pox and meaſles "quos tanquam præcurſores ſequebatur epidemica lues, incredibili graſſationis ſævitia," depopulating towns and country, in Turkey, Egypt, France, England and Germany. Obſervations, p. 748.

Skenkius remarked that the plague followed the other epidemics, as *its precurſors*.

The ſame author takes notice of a malignant angina, in 1564, which often proved fatal in a few hours, like the plague. I mention this, becauſe the learned Dr. Fothergill, and tribes of modern phyſicians who follow a celebrated name, have alledged that the angina maligna is a new diſeaſe, not known in Europe till about the year 1610, altho it never was more fatal, than in England in 1517.

In 1573 prevailed dyſentery, meaſles, and purple fever, which in 1574, ſays Skenkius, *changed into the plague*. His words are remarkable. "Dudum ſane præſagiebat animus mihi, malignum hoc febrium genus, quod toto biennio Europæ partem non minimam peragravit, velut ſparſis quibuſdam præludiis, in peſtem apertiſſimam tranſiturum. Neque me adeo mea fefellit opinio." Obſerv. p. 761. This author foreſaw the plague, by means of its precurſors.

"Eodem modo variolæ, morbilli, dyſenteriæ groſſantes, ſæpiſſime ſunt præcurſores internuncii peſtis." Epidemic ſmall-pox, meaſles and dyſentery, are very often the forerunners of the plague.

Hoſtices, p. 253.

It is a common remark that the reigning epidemic ſubdues all other diſeaſes, or compels them to aſſume its character. This remark, as a general one, is juſt; and is of no ſmall weight, in proving the connection between certain ſpecies of epidemics. In the ſpring of 1795, the meaſles prevailed in New-York, but of a mild type. In Auguſt, this diſeaſe diſappeared, being completely merged in the bilious fever that ſpread from Auguſt to November. No ſooner had the fever ſubſided, than the meaſles re-appeared, and was of a leſs favorable type. This is a contagious diſeaſe, and yet how impotent was its contagion, in the inſtance related, under the all-controlling influence of the ſeaſon and the elements.—It diſappeared in ſummer in defiance of the powers of ſpecific contagion, and was reproduced in autumn, without its aſſiſtance.

This fact demonſtrates that a general cauſe operated in the production of that diſeaſe ; which general cauſe, in ſummer, was controlled, by the heat of the ſeaſon and local cauſes in that city ; theſe temporary and local cauſes operated during a particular time, and gave a different complexion to diſeaſes ; when they gave way, at the approach of winter, the general cauſe again aſſumed its empire and reproduced the meaſles, which is a diſeaſe little affected by local cauſes.

But while local cauſes predominated, in producing bilious plague, the general cauſe was not altogether inefficient ; no bilious peſtilence ever becoming epidemic and infectious, but under the influence of a peſtilential conſtitution.

A fact related in Fairfield's diary, relative to the ſmall-pox in Boſton in 1702, is very much in point.

This diſeaſe appeared in June and gave much alarm ; but proved to be of a mild type, and none died of it for ſeveral weeks. It continued to be favorable, till September, when it aſſumed a more formidable aſpect ; being attended with what the writer calls a ſcarlet fever. The ſeaſon was exceſſively dry. In December, the ſcarlet fever abated, but the ſmall-pox continued to be very mortal, till the following ſpring. Theſe facts are related by an unlettered, obſerving man ; but they are evidence of a progreſſiveneſs in the diſeaſe. The efflореſcence that accompanied the diſeaſe from September to December was only a particular, malignant ſymptom or modification of the ſmall-pox, produced by ſeaſon or other temporary cauſe.

The meaſles often exhibits a ſimilar progreſſion. This circumſtance explains the difficulties mentioned by medical writers. Dr. Ruſh mentions the circumſtance of perſons in 1789, who had a fever, cough and all the ſymptoms of meaſles, except a general eruption. Some had a trifling efflореſcence about the neck and breaſt. The ſame happened in 1773 and 1783. Vol. 2. 238. The fact is alſo mentioned in Edinburgh Medical Eſſays, vol. 5. Perſons thus affected have the meaſles, months or years afterwards. This lighter ſpecies of the meaſles is produced by the ſame general cauſe which produces the diſeaſe in full force ; but the conſtitution, at that time, reſiſts the further operation of the cauſe. At a future time the cauſe will produce the diſeaſe complete.

Under the hiſtory of the diſeaſes of 1792 and 3, I have related the progreſs of the late ſcarlatina in this country. There cannot be ſtronger evidence of the progreſſion of an epidemic influence in the atmoſphere than the hiſtory of that diſtemper has furniſhed. The violent ſtage of that diſeaſe, was preceded four, five, and in ſome places eight months, by a milder ſpecies of the diſorder ; and this mild form was, in ſome places, an epidemic. Theſe facts entirely overwhelm all the pretended influence of infection, in originating the diſeaſe. They prove inconteſtibly that a ſtate of air ſuited to the production of that diſeaſe, was not the effect of any ſudden, viſible change in the ſeaſons ; for the mild form of the ſcarlatina appeared indifferently, in any ſeaſon of the year ; as at New-York in Auguſt, at Hartford in May and at New-Haven in November ; but that it was a progreſſive change, gradually inducing debility in the human body, or whatever elſe may be its prediſpoſition to a particular diſeaſe.

Whether the ſcarlatina appeared, in any part of the country, without being announced by this ſlight form of the diſeaſe, is a queſtion that cannot be ſolved, without particular information from every town. And very poſſibly the fact itſelf may have paſſed, in ſome places, unobſerved. But the progreſſiveneſs of the diſtemper was diſtinctly marked in New-York, in Fairfield, in New-Haven, in Bethlem and in Hartford.

The ſame phenomenon was obſerved in the ſame diſeaſe, in 1786, in London. The firſt caſe appeared in March, was of a mild kind and excited no great apprehenſion. No other caſe occurred to the knowledge of the phyſician, except in the ſame family, till May, when another caſe appeared, but of a light kind. In June, the diſeaſe became epidemic and malignant.

Here we obſerve the progreſs of the peſtilential principle, in England, like that which has been obſerved in America.

See Memoirs of the Medical Society, London, vol. 1. 388.

A remarkable fact mentioned by the great Mr. Boyle, in the fifth volume of his works, p. 724, ſerves to ſhow the regular progreſſion of that ſtate of air which produces the plague. In 1665, three months before the plague broke out in London, a man ſent for a phyſician, complaining of a ſwelling in his groin, from which circumſtance he predicted the plague which was to follow, and ſaid he had experienced the ſame ſwelling in the former plagues, which he conſidered as the certain forerunner of the diſeaſe. Boyle took this account from the phyſician himſelf.

This was no whim, for it is perfectly philoſophical. It is a common fact, that, during the plague, in a city, perſons in health experience ſevere pains in the glands, as in the groin and under the arms, thoſe ſenſible parts which are peculiarly affected by the diſeaſe. Sorbait mentions that he felt ſuch pains, during the plague in Vienna in 1679, and others did the ſame, but without any tumor. Dr. Gothwald experienced ſimilar pains in the plague at Dantzick in 1709.

See Baddam's Memoirs, vol. 6. 12.

Boyle, vol. 6. 429, relates that one Beale knew a woman who could certainly tell when the plague was in the neighboring country, by a pain in the wounds of three ſores ſhe had, when affected by the plague in her youth. The relation is altogether credible; for we know that the ſtate of air producing the diſeaſe, occaſions pains in the glands of perſons in health; much more therefore would the ſame parts, after being rendered more ſenſible by plague ſores, be affected with pain, during a ſimilar ſtate of air. The facts demonſtrate that the plague is produced by a peculiar ſtate of air, which may be perceived before the diſeaſe appears; and much more, during its prevalance, by perſons in health.

Another fact demonſtrative of the ſame doctrin of a progreſſion in the peſtilential principle, is, the unuſual number of abortions, which *precede* the invaſion of a ſevere plague. This fact was obſerved by Diemerbroeck, previous to the plague in Nimuegucn, in 1636, and is numbered by him among the preſages of the diſeaſe. De peſte page 11. Other authors have recorded the ſame fact, among whom Diemerbroeck cites Alexander Benedictus, Foreſtus and Seunertus.

The cauſe aſſigned for this phenomenon, is, "the debility of the heart and other viſcera, which renders the tender body of the fœtus incapable of reſiſting the malignity of the peſtilential poiſon, and which expoſes the woman in a pregnant ſtate, to continual irritation."

In confirmation of this principle, we may cite the facts, ſo frequently mentioned by writers on this ſubject, that the plague rarely or never ſpares pregnant women. This was remarked by Livy and Dionyſius in Rome—by Procopius and Evagrius, in the plagues of 543 and 590, and by ſubſequent writers.

The fact authorizes the ſuppoſition, that a peſtilential ſtate of air induces extreme excitement or irritability, and conſequently indirect debility, eſpecially in the nervous and vaſcular ſyſtems. The effect of this general cauſe muſt of courſe be firſt viſible in perſons moſt ſuſceptible of excitement—among whom are pregnant women, which is obvious from the facility with which they receive impreſſions from the ſight of unnatural objects. The appearance of the effect of the peſtilential ſtate of the atmoſphere, on ſuch perſons, *previous to its fatal effects on other perſons*, leaves no room to queſtion its gradual increaſe in ſtrength.

Of the progreſſiveneſs of peſtilential epidemics therefore we can have no doubt, nor of their connection through a common cauſe. The order in which they ſhow themſelves is not exactly the ſame; being varied by a multitude of ſubordinate cauſes, as ſeaſons, weather, noxious exhalations, and ſometimes perhaps by infection.

The accounts of diſeaſes in the two or three laſt centuries are recorded with ſo little regard to juſt arrangement, that it is not eaſy to collect from them the exact order in time, in which the epidemics of any particular period have appeared. Sydenham however has left an admirable ſample of the hiſtory of epidemics in London from 1661 to 1680—a ſample that throws immenſe light on the principles here maintained—a ſample which ought to be well ſtudied, and which it is inexcuſeable in medical writers not to imitate. Let any man obſerve the regularity with which certain eruptive diſeaſes, as the meaſles and ſmall-pox, appeared and ſubſided, according to the ſeaſons, during the conſtitution of air fitted to produce them, until both yielded to a different conſtitution, and then ſay, whether he can queſtion Sydenham's principles, or the exiſtence of a general contagion, operating in the production of a particular claſs of diſeaſes. Under a philoſophical view of ſuch facts, into what trifles will dwindle all the formidable vulgar doctrines about infection !

It muſt however be remarked, that the ſmall-pox, in modern times, will not exhibit ſimilar effects as formerly ; ſince the art of inoculation has nearly baniſhed the diſeaſe as an epidemic, from our cities, where alone it uſed to prevail to any conſiderable extent.

Let us then attend to the order of the epidemics which have marked the lateſt periods of peſtilence in America ; many of which are within the memory of the preſent generation.

A. D.	
1733	influenza.
1734	unknown.
1735 1736	angina maligna.
1737	ſevere influenza.
1738 1739	peſtilence in Barbadoes, Charleſton and Mexico, meaſles New-England.
1740	meaſles America.
1741	angina, peſtilence Philadelphia and Virginia.
1742	anginas.
1743	peſtilence in New-York.
1745	dyſentery, peſtilence New-York and Charleſton.
1746	peſtilence at Albany and among the Mohegans,
1747	influenza.
1748 1749 1750 1751 1752 1753	meaſles, dyſentery and angina.

1754 1755	angina.
1756	dyſentery in ſome places.
1757	influenza.
1758	meaſles.
1759	meaſles, dyſentery, fevers.
1760	unknown, till autumn, then
1761	influenza and inflammatory fevers very fatal.
1762	peſtilence in Philadelphia.
1763	peſtilence among the Indians on Nantucket.
1764	
1765 1766	dyſentery.
1767 1768	unknown.
1769	meaſles, angina.
1770	angina, fevers.
1771	catarrh, angina.
1772	influenza and meaſles, angina.
1773	angina, dyſentery.
1774	angina, dyſentery.
1775 1776 1777	angina and dyſentery very fatal.
1778	fevers, but no epidemic.
1779	health.
1780	health.
1781	influenza.
1782	influenza, Europe.
1783	meaſles, angina.
1784 1785 1786 1787	anginas and bilious fevers.
1788	meaſles began in autumn.
1789	meaſles, influenza.
1790	meaſles, influenza.

1791 peſtilence began in New-York, but not ſevere.
1792 angina began in New-York.
1793 angina, plague, dyſentery.
1794 angina, plague, dyſentery.
1795 angina, plague, dyſentery, meaſles.
1796 angina, plague, dyſentery, meaſles.
1797 plague, dyſentery.
1798 plague, dyſentery, typhus mitior.
1799 plague.

Such has been the general courſe of epidemic diſeaſes in America, as far as I can obtain information. Further enquiries may render the account more accurate, and more nearly perfect.

It will be obſerved that the order is not quite uniform; nor is this to be expected, conſidering the various cauſes which concur in the production, and diverſification of diſeaſes. In general, meaſles and catarrh precede anginas, dyſentery and peſtilential fevers. And it is remarkable that theſe diſeaſes belong to the claſs of inflammatory diatheſis: So does the mild ſmall-pox, which, before the practice of inoculation, was almoſt regularly a precurſor of the plague in the cities of Europe.

In general then epidemic diſeaſes firſt attack the brain and the throat, before they ſeize the whole nervous ſyſtem and the abdominal viſcera. It is obſervable alſo, that winter, ſpring and autumn, produce moſtly diſeaſes of the ſtenic diatheſis, as meaſles, catarrh, and inflammatory fevers; and ſummer, diſeaſes of aſtenic diatheſis, as typhus fevers, dyſentery of a malignant kind, and plague. Indeed the plague ſeems to begin and end in catarrh—that is, it begins in catarrh in winter and ſpring, takes the form of plague, during the hot ſeaſon, and re-aſſumes the catarrhal and inflammatory form in the ſucceeding winter. The meaſles and influenza, however, prevail at any ſeaſon.

When I arrange epidemics under particular years, I ſpeak of thoſe diſeaſes which extend over a whole country, or occur in many places. If we look into large cities, we ſhall find ſome of theſe diſeaſes, almoſt every year. But my obſervations relate only to thoſe diſeaſes when they become general, or occur in various parts of a country in the ſame year.

When I place angina, plague and dyſentery againſt a particular year, it is not intended that theſe diſeaſes were all epidemic in the ſame place. Thus, while in 1793 the plague was in Philadelphia, the ſcarlatina began to prevail in New-York and the weſtern part of Connecticut. For it muſt not be overlooked, that although meaſles and influenza appear nearly at the ſame time in all parts of the United States, yet the peſtilential fevers that follow them firſt ſhow themſelves in the larger cities in the ſouthern latitudes. Thus the meaſles and influenza were univerſal in 1789 and 90, at leaſt this was the caſe with the influenza ; but the bilious plague broke out in New-York, Philadelphia and Charleſton, before it did in Boſton and Newburyport. The ſame is obſervable in the other hemiſphere. The influenza ſpreads over Aſia, Europe and Africa, in a few weeks, but the following peſtilence firſt appears in Egypt or the Levant, or in Turkey, then in the northern parts of Europe. To theſe remarks there are few exceptions.

It is alſo obſervable, that the peſtilence in cities takes the form of petechial fever and plague ; but in country towns, more generally terminates in dyſentery.

It is a popular opinion that meaſles and ſmall-pox never originate in the human conſtitution, without contagion. The palpable abſurdity of ſuch an opinion has not prevented its propagation and belief, among even well-informed men. So far is this opinion from truth, that the firſt caſes of theſe diſeaſes in every epidemic period, are always generated in the human body, without contagion. When the condition of the elements is fitted to produce theſe diſeaſes, they appear in all parts of a country, without contagion, they ſpread rapidly, and decline when the general cauſes ceaſe to operate. During this period, contagion is efficacious in propagating them, and no longer. When the condition of the elements is not fitted to produce them, if ſporadic caſes appear in particular habits of body, they will not always ſpread the diſeaſes.* Sydenham long ago taught this truth, in deſcribing the changes in the epidemics of 1670—1672. Meaſles and ſmall-pox came and went with the ſeaſons and condition of the air.

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* This is here meant of the natural contagion of the diſeaſes from the breath and effluvia, which is not always efficacious in ſpreading them. The variolous matter of ſmall-pox is excepted ; for, if good, this will generally communicate the diſeaſe at any time.

The truth is, that certain conditions of the elements tend to produce *eruptive diſeaſes*, and before the practice of inoculation, the ſmall-pox was almoſt regularly one of that ſeries of epidemics which I claſs together, as of one family, and the precurſors of plague. It is nearly allied to the meaſles, and appears uſually about the ſame time. I am convinced that catarrh, meaſles, mild ſmall-pox and whooping cough, are but varied forms of diſeaſe, occaſioned by modifications of the ſame elemental cauſes.

Certain it is, they are all predominant about the ſame time, and as a general remark, they *precede* the invaſion of diſeaſes which bear the character of *typhus*.

I have never converſed with a phyſician who could not name inſtances of ſmall-pox, originating without any known contagion, and generally medical gentlemen admit the diſeaſe to be generated in the conſtitution. This principle is unqueſtionably juſt, and ought to be known, and received as truth ; for the belief that contagion is neceſſary to the exiſtence of the diſeaſe, has produced moſt miſchievous conſequences. An inſtance happened in Sharon a few years ago, in which a woman was ſeized with the ſmall-pox ; but as ſhe had not been expoſed to contagion, her diſeaſe was miſtaken, till juſt before her death ; and twenty or thirty perſons were ſuppoſed to have taken the diſeaſe before the true nature of it was underſtood.

In the winter of 1797-8, occurred in Hartford two ſporadic caſes of meaſles, which could not poſſibly be traced to contagion. At another time, a family was infected by means of a ſtranger ; but in neither of theſe caſes was the diſeaſe propagated to others, who were expoſed to the breath of the patients. See Dr. Cogſwell's letter, Med. Repoſ. vol. 2. 301. Innumerable ſimilar inſtances may be mentioned.

In the ſame manner the various ſpecies of angina and the plague occur in ſporadic caſes under the operation of powerful local and conſtitutional cauſes, which, if not favored by the condition of the elements, will not ſpread and become epidemic.

SECTION XIV.

Of the extent of a peſtilential ſtate of air.

FROM a view of the facts related in the preceding hiſtory, it appears that epidemics, agreeable to the definition already given, are of two kinds—firſt, thoſe which are limited to a particular town, city or country ; ſecondly, thoſe which pervade whole quarters of the earth, or the whole globe. The firſt may be called local, the laſt, general or univerſal epidemics.

The local epidemics, moſt uſual, are dyſentery, remitting and intermitting fevers, and peſtilence. The epidemic, moſt frequently univerſal, is the catarrh or influenza. Angina is often a general epidemic, ſometimes local. Peſtilential fevers, in certain periods become general over vaſt tracts of the earth. The ſame is obſervable of the meaſles.

The epidemic catarrh is the diſorder which moſt deciſively proves a rapid and univerſal change in the eſſential properties of the atmoſphere. This diſeaſe ſometimes invades the human race ſo ſuddenly, that half the inhabitants of a town or city are ſeized in a night. I do not find the ſame fact related of any other diſeaſe, except the ſweating plague in 1529, whoſe progreſs through Europe was as rapid nearly as that of the catarrh, and utterly precludes the ſuppoſition that infection from fomes, had any ſhare in its propagation.

Catarrh however is not always a univerſal epidemic. In many inſtances, it is confined to one hemiſphere, as in 1647, 1655, to America ; and in 1650, 1775, to Europe.

In other inſtances, this diſeaſe ſpreads over the whole world, in a ſhort period, but is progreſſive, appearing in the two hemiſpheres, in two different years. Thus in 1761, it was epidemic in America ; in 1762 in Europe.—In 1781 in America ; in

1782 in Europe; in 1698 in America; in 1699 in Europe. In two or three inſtances, I find it in both hemiſpheres in the ſame year.

The compilers of the Encyclopedia ſay that catarrh from contagion has "ſeldom appeared in any one country in Europe, without appearing ſucceſſively in almoſt every different part of it; and in ſome inſtances, it has been alſo *transferred* to America, and has been *ſpread* there, ſo far as we have had opportunities of being informed."

See article, Medicine, No. 253, from Cullen.

No ſource of errors, in the ſcience of medicin, is more fruitful than the doctrin of contagion. It would ſeem from the paſſage recited, that the writer conſidered catarrh as propagated by fomites from diſeaſed perſons; and conveyed acroſs the ocean by the ſick, or in goods or cloathing. The words will admit of no other interpretation; and yet it is hardly credible that, in this period of ſcience and obſervation, an obvious and common phenomenon ſhould be ſo egregiouſly miſunderſtood.

The catarrh, whenever it has appeared as a general epidemic, inſtead of being *transferred* to America, has uſually appeared in America *before* it has in Europe or at the ſame time; and ſo far is contagion from being the neceſſary cauſe of its origin and propagation, that the diſeaſe invades ſeamen on the ocean in the ſame hemiſphere, when a hundred leagues from land, at the ſame time that it invades people on ſhore. Of this I have certain evidence from the teſtimony of American Captains of veſſels, who have been on their paſſage from the continent to the Weſt-India Iſlands, during the prevalence of this diſeaſe.

If further evidence is required, we have the fact, that the epidemic catarrh in America rages with as much violence in the iſlands as on the continent, and at the ſame time. And in the preceding hiſtory, it is ſtated on the authority of a medical publication in Scotland, that the univerſal catarrh of 1733, appeared in the Iſle of Bourbon, in the Indian Ocean, about the time it did in Europe.

From theſe facts, it is evident that the diſeaſe is occaſioned by an alteration in the atmoſphere. In many inſtances it is limited to one hemiſphere; but it is obſervable, that whenever it appears on the American continent, it appears alſo in the iſlands of the Weſt-Indies. Its range is through a certain ſection of the globe, nearly in the ſame longitude, north and ſouth, on one of the great diviſions of the earth, and in the vicinity of the continent. The epidemic catarrh of America extends certainly from the northern limits of the United States to the iſland of Barbadoes. Whether it appears at the ſame time in South-America, I cannot find a hint in any author to guide my opinion, except in regard to the laſt epidemic, which pervaded that part of the continent.

The catarrh of 1733 extended over the globe, but it appeared firſt in America. Poſſibly there may have been other inſtances, ſince the ſettlement of America, but I have little information on this point, in regard to this country. It is not probable, for inſtance, that the ſevere catarrh of 1708-9, was confined to Europe, but it is uſeleſs to indulge conjecture.

The remote cauſe uſually aſſigned for catarrh is a ſudden change of weather, from heat to cold or from cold to heat—the proximate cauſe, an increaſed afflux of fluids to the mucous membrane of the noſe, fauces and bronchiæ, with ſome degree of inflammation. Some medical writers ſeem to think the remote cauſe to be the application of cold only to the human body, checking the perſpiration by the ſkin, and turning the fluids upon the mucous membrane. See Cullen on this point.

The proximate cauſes of the diſeaſe are the province of medical men ; but to the influence of the remote cauſe above ſtated, phyſicians will pardon me for ſtating a few objections.

1. The application of cold to the body cannot be the ſole cauſe of catarrh, becauſe it appears, and uſually with moſt ſeverity, in the ſpring, on the abſtraction of cold. It is obſervable alſo, that in many inſtances its principal violence and mortality, are, after the return of warm weather—the diſeaſe augmenting in violence with the increaſe of heat. Thus the catarrh of 1709 appeared in Italy, ſays Lanciſius, in January in ſevere cold weather, but increaſed in violence, as the ſpring advanced and the weather moderated.

The ſame fact took place in the catarrh of 1762 at Edinburgh, where it began in April and increaſed in violence till June.

In the ſame manner, the catarrh in this country in 1790, appearing in March and April, on the moderation of cold, was far more ſevere than that of the preceding autumn, when the weather was changing from heat to cold. At leaſt this was the fact in many of the northern ſtates.

2. It is not always true, that the epidemic catarrh appears in ſpring or autumn, or after great changes of weather. The noted catarrh of 1580 began to appear in Sicily in the month of June; at Rome in July; at Venice and Conſtantinople in Auguſt—in the midſt of ſummer. It is againſt all probability, that this diſeaſe can be aſcribed to the application of cold. On the other hand, its progreſs was evidently ſteady, and uninterrupted by either heat or cold—A careful attention to the hiſtory of this epidemic at other times, will doubtleſs furniſh other ſimilar facts.

The catarrh of 1688 ſeized Germany in ſummer; that of 1557 appeared in Spain in Auguſt; that in America in 1655 began about the cloſe of June.

3. The appearance of catarrh in tropical climates, as in the Weſt-Indies, at the ſame time it appears in northern latitudes, is a ſtrong argument againſt aſcribing it to the application of cold. In the Weſt-Indies there is no change of any great conſequence, in the temperature of the weather; nothing like *cold* is known in thoſe regions. Yet catarrh, if credible accounts are to be admitted as evidence, is as fatal at times within the tropics, as in any other climate.

It is true, that in autumn winds called *norths*, northerly breezes, are experienced in the iſlands, and theſe produce colds and coughs ſimilar to what we all experience, in temperate latitudes, on the change of weather in ſpring and autumn. But theſe are very different, at leaſt in degree, from a general epidemic influenza, which ſeizes mankind in all climates, with pain in the ſide and bones, accompanied often with fever. The univerſality of this diſeaſe, burſting ſuddenly upon all climates, and raging with equal violence in all ſeaſons, and in defiance of heat or cold, leave us no room to queſtion its dependence on ſome other cauſe than changes of weather or application of cold.

4. If the application of cold was the ſole cauſe of this epidemic, it would appear at the ſame time in all places which experience a ſudden change from heat to cold at the ſame time. And fur-

ther, a neceſſary conſequence would be, it muſt be epidemic on every ſuch change. Neither of theſe caſes occurs. On the other hand, the diſeaſe begins indifferently in any climate and in any ſeaſon of the year, and ſpreads ſpeedily over whole countries, without the leaſt obſtruction from heat or cold: And as far as I can obſervé from the accounts of it before me, it is as mortal when it invades people in hot climates, as in cold or temperate regions and ſeaſons. It is alſo progreſſive in point of place; but it moves with a celerity unknown to all other diſeaſes. Sometimes it paſſes over Europe in ſix weeks. In America, its duration in 1789 and in 1790, was nearly the ſame. Different epidemics, however, differ in the rapidity of their movements: That of 1580 was about ſix months in traverſing Europe.

Different epidemics alſo differ in point of generality and violence. Sometimes the catarrh is a light complaint; at other times it is attended with fever, and occaſions no inconſiderable mortality. The catarrh in the ſpring of 1790, was much more ſevere than that of the autumn preceding. In 1789, it reſembled a ſevere and univerſal cold—in 1790, it bordered more on the pleuriſy and peripneumony. To theſe remarks there may have been particular exceptions.

5. It appears to me alſo, that, with deference to the faculty, a ſtrong argument againſt deriving the diſeaſe from ſudden changes of weather only, may be drawn from a difference in the ſymptoms of an epidemic influenza and of ſporadic caſes of the diſeaſe, obviouſly contracted by cold. Let me aſk practitioners, whether in the epidemic catarrh, there do not appear ſymptoms altogether unknown in ſporadic caſes? But as this is a point that regards practice, it is not proper for me to diſcuſs it.

The celebrated Boyle very juſtly obſerves that ſudden epidemic colds, are not to be accounted for by changes of weather. Vol. 5, p. 49.

I do not, however, deny the influence of heat and cold in the epidemic catarrh. In ſome violent epidemics of this ſort, heat and cold ſeem to have little influence—the diſeaſe appearing to rage, independent of all the ſenſible qualities of the air. Yet in ordinary caſes, the temperature of the air ſeems to *modify*, but not to *generate* or *deſtroy* the epidemic.

Brown, in his elements of medicin, arranges catarrh among diſeaſes of the ſtenic diatheſis. Whether he meant to extend his obſervation to ſporadic caſes from cold only, or to the influenza alſo, I do not know ; but it may not be improper in me to mention, that in many epidemics of this ſort, bleeding has proved injurious or fatal. The moſt generally ſucceſsful remedies have been the diaphoretic, although there have been a few exceptions, in which bleeding was ſalutary. Indeed no diſeaſe ſeems to admit of a greater diverſity of ſymptoms.

Next to the catarrh, in the liſt of general epidemics, we may perhaps arrange the meaſles, which, though ſometimes a local diſeaſe, often appears over whole countries, and ſometimes in both hemiſpheres at the ſame time.

This diſeaſe is attended with ſpecific contagion, which aids its communication from place to place ; but it derives its origin from a particular ſtate of the atmoſphere. Hence it appears in one ſeaſon and diſappears in another, yielding to ſome other diſeaſe, as Sydenham remarked in the year 1672, and which we obſerved in New-York in 1795. It is nearly allied to the catarrh as is evident from the catarrhous ſymptoms that attend it. Brown claſſes the meaſles in the number of ſtenic diſeaſes.

It will be found on examining the hiſtory of diſeaſes, that the meaſles uſually *precedes* or *follows* an epidemic influenza. The two diſeaſes therefore manifeſt a cloſe alliance in the remote cauſes.

My accounts of epidemics are too imperfect to authorize the aſſertion, that theſe diſeaſes *always* appear nearly together ; but this has been the fact, with reſpect to a number of the laſt epidemic periods in America. The order however is varied. Sometimes alſo a ſlight degree of one or both of theſe diſeaſes is experienced in particular places, when neither of them is epidemic. But when they become violent and general, they are nearly cotemporaneous, ſpreading ſucceſſively over a large portion of the earth, and ſometimes over both hemiſpheres.

In 1772 the catarrh and meaſles raged in the ſame year, from Boſton to Charleſton. To theſe ſucceeded anginas and dyſentery, for a ſeries of years. In 1781 and 2 catarrh pervaded the globe. In 1783 began meaſles in May, and angina in Auguſt. In 1789 meaſles preceded the influenza. In 1757 influenza preceded the meaſles.

An epidemic which uſed formerly to make a figure in medical hiſtory, as one nearly cotemporary with meaſles, was the ſmall-pox. The diſeaſe was obſerved by Sydenham, to rage alternately with meaſles in different ſeaſons of the year. Like the meaſles, it is an eruptive diſeaſe, of the ſtenic ſpecies ſpecifically contagious, and evidently depending on the ſame general cauſe, though on different temporary or local cauſes. Inoculation has nearly baniſhed this from the liſt of epidemics.*

But a more formidable epidemic, and perhaps the moſt formidable to which the human race is expoſed, is the angina, uſing this word to denote all the different kinds of affections of the throat. I call it the moſt formidable, becauſe hitherto no means have been diſcovered of arreſting its progreſs. Its horrors and fatality are not mitigated by inoculation, like thoſe of the ſmall-pox; nor are its uſual ravages limited to populous towns, like thoſe of the plague. Under all aſpects, therefore, I conſider it as a far more dreadful diſeaſe than either, becauſe the others may be mitigated or avoided.

Affections of the throat, either in the form of ſcarlatina anginoſa, angina maligna, cynanche trachealis, &c. are among the epidemics which belong to almoſt every peſtilential period. In the order of appearance they have not one uniform place; but in America, anginas have uſually ſucceeded catarrh, the firſt or ſecond year, and continued to the fourth or fifth. In the three laſt epidemic periods, this order has been very uniform. I ſpeak of epidemic angina which ſpreads over the whole country; for in particular places we hear of it almoſt every year.

Theſe diſeaſes in our large cities have been ſucceeded by the bilious plague, and in the country, by violent remittents, typhus fevers and dyſentery.

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* It is a common error that this diſeaſe never originates without contagion. Before the art of inoculation, it was an epidemic in large cities, appearing and diſappearing with as much regularity and certainty as the meaſles. I can name many inſtances of its originating in this country without contagion or infection, and I have the authority of many old practitioners of medicin for the fact. It moſt uſually appears in thoſe years which manifeſt a diſpoſition to produce other eruptive diſeaſes.

Sometimes angina prevails without being followed by the plague: That is, the conſtitution of air terminates at that point of its peſtilential progreſs. Such ſeems to have been the fact with the angina of 1755. And in all caſes in which it is of a mild kind, or not univerſal, ſtrong hopes may be entertained, that no plague will follow it. The epidemic anginas from 1783 to 1786, were of this kind.

With reſpect to the univerſality of the cauſe of theſe epidemics, it is to be obſerved, that it is of two kinds—ſometimes it extends to both hemiſpheres, at other times it ſeems to be limited to one. Thoſe diſeaſes, however, which are leaſt influenced by heat or cold, or which depend moſt on ſome inviſible ſtate of the atmoſphere, appear moſt frequently in both hemiſpheres, at the ſame time. This fact, with reſpect to the catarrh, has been particularly noticed.

The ſame fact is obſervable very often with reſpect to the meaſles, and eſpecially with regard to anginas. Theſe affections of the throat, when violent, are nearly cotemporary in Europe and America. Witneſs the periods from 1751 to 1756—from 1773 to 1776—1783 to 1786—from 1793 to 1796, and in 1742.

This cotemporaneouſneſs of certain epidemic diſeaſes, in both hemiſpheres, is an important fact which has hitherto been little noticed, but which opens a new field for philoſophical inveſtigation. It demonſtrates that ſuch diſeaſes are occaſioned ſolely by a conſtitution of air, without the influence of contagion, although when the diſeaſes are formed, they are contagious.

But we have further facts of a ſimilar nature. It is obſervable that the peſtilential principle often extends from Egypt, Syria and Turkey, over all Europe and to America. But the ſame diſeaſes, that is, the ſame forms of the peſtilence, do not always appear in Egypt or Turkey, and in France, England and America, in the ſame year. It is a general fact, that the worſt form of peſtilence, the inguinal plague, appears firſt in Cairo, Smyrna or Conſtantinople; and from this circumſtance, the advocates for the propagation of that diſeaſe by ſpecific contagion, have drawn their moſt powerful arguments in ſupport of their theory. But this argument is founded on a view of the ſubject, moſt miſerably narrow and obſcure.

In every peſtilential period, there is a ſeries of epidemic diſeaſes. The order in which they appear depends on local or temporary circumſtances. Thus in Grand Cairo or Conſtantinople, the climate or the ſtrong local cauſes, ſpeedily bring the peſtilential principle to its criſis, in the production of the plague. For this reaſon, that diſeaſe appears in thoſe cities, ſome time *before* it does in northern latitudes or in more healthy cities.

But at the very time the plague appears in Conſtantinople or Cairo, ſome lighter epidemic diſeaſe, belonging to the ſeries, appears in other parts of the world, indicating the approach of peſtilence. Thus, in 1580 and 81, Cairo was deſolated by a hideous plague ; but, at the ſame time, a ſevere epidemic catarrh burſt forth on all Europe, the certain forerunner of peſtilential fevers, and which, in that inſtance, was ſucceeded by plague in 1582 and 3, as far north as England. Let facts within late periods, decide this queſtion.

The plague appeared in the Turkiſh dominions in 1718, but in 1719 became more general. In 1718 the bills of mortality were conſiderably ſwelled in Amſterdam, London and Vienna, but in 1719 they roſe, in the two former cities, conſiderably higher—the peſtilential ſtate of air pervading the moſt of Europe. I have no account of the ſtate of diſeaſes in Marſeilles, in 1718 ; but in 1719 appeared a peſtilential fever, which increaſed the mortality, altho the peſtilential principle did not riſe to its height till the ſubſequent year.

In this period, cotemporary with the plague in the Levant, was a univerſal increaſe of mortality in Europe, and the ſame ſtate of air was experienced in America, altho, in very few parts of Europe, did the peſtilential principle ariſe to the degree of plague.

In 1726 we again hear of the plague in Egypt, and for two or three years ſucceeding, the bills of mortality were ſwelled in Europe and America. Of the epidemics that prevailed in America, I regret my want of information.—I only know that meaſles and malignant pleuriſy prevailed in this country.

In 1735 and 6 raged the moſt deſolating ſore throat in America, and at the ſame time, the moſt fatal plague in Egypt, that has appeared in this century. This peſtilence, like that in the time of Thucydides, took its riſe in the interior parts of Egypt or Ethiopia. And it muſt not be overlooked that the violence of the peſtilence in Egypt correſponded with that of the ſore throat in America—a fact which, as far as I can diſcover, is generally true, that the more fatal the epidemics that prevail over one quarter of the globe, the more violent are the ſame or other peſtilential diſeaſes, in the other hemiſphere. It makes little difference, that in one country rages the glandular plague, and in another the petechial fever or putrid ſore throat—Theſe are only different forms of peſtilence, the *effects of one common cauſe, modified by local cauſes.* The great point is, that ſuch epidemics are *cotemporary in countries the moſt remote.* Slight epidemics may appear alone, but never the more ſevere and deadly forms of peſtilence; excepting perhaps dyſentery, or ſome other complaints that depend moſtly on the ſeaſons.

The years 1740-41 and 42 were alſo peſtilential. At what time the plague of this period firſt appeared in the eaſt, I am not informed. But it raged in Syria from 1742 to 1744, and it rarely happens, that it is not a year or two earlier in Egypt or Conſtantinople, than in Syria. Cotemporary with the plague of this period was great mortality in London and Amſterdam from the petechial fever, which fell but little ſhort of the plague. See the bills.

At the ſame time, raged in America a ſeries of epidemics, particularly meaſles, anginas and the bilious plague; the latter appearing in Philadelphia and Virginia in 1741, and in N. York in 1743, the ſame year with the dreadful peſtilence in Meſſina.

The year 1755, the year of a great plague in Conſtantinople, was diſtinguiſhed for catarrh in Europe, and ſore throat both in Europe and America.

In 1758 commenced the peſtilential period, which was univerſal and felt in both hemiſpheres, in ſome one or all of the years from 1758 to 1763. Here, it is obſervable, our information is more correct. In 1758, cotemporary with the beginning of this peſtilence, was an epidemic catarrh in Europe. Then followed other epidemics of a more malignant type. During this peſtilential period appeared in America, the catarrh and meaſles, and the plague in Philadelphia in 1762; but eſpecially the fatal epidemic pleuriſy in 1761.

The next period commenced in 1769 or 1770, in which the plague ſpread over the eaſt. This period was begun by meaſles and anginas, if my information is correct, in 1769—catarrh was epidemic in 1771 and 2, and in the latter year meaſles of a bad type. Then followed angina, and the epidemics all cloſed in dyſenteries. The plague in the Levant was cotemporary with the commencement of this period.

I am not informed of the preciſe time when the plague of the next period commenced in the Levant, but it was raging in 1783 and 4, during the prevalence of meaſles and angina in America.

In the laſt period, the plague in Egypt was very violent, about the time the mortality commenced in America. Of the preciſe time when it began in Egypt I am not informed; but it prevailed in 1791, the year it appeared in New-York and Grenada, and was moſt deſtructive the following year, 1792, the year when the ſcarlatina firſt appeared in the northern parts of America.

I have no further accounts of the plague in Egypt, but the public prints have informed us, the diſeaſe prevailed in Conſtantinople in 1797, and was more general in the Turkiſh dominions in 1798, the moſt fatal year in America.

The reader will be pleaſed to remark, that when I ſpeak of the plague in Grand Cairo or Conſtantinople, I refer only to violent and deſtructive epidemics. The plague, in a light form, and in a few caſes, occurs almoſt annually in thoſe great cities, where the common cauſes and ordinary ſeaſons are adequate to its production in particular conſtitutions. But, let me obſerve, that no extenſive and deſolating plague ever ravages either of thoſe cities, except under the influence of general contagion, or an epidemic ſtate of air, which is experienced, nearly at the ſame time, in Europe and America.

Theſe facts enable us to ſolve the whole difficulty which has puzzled phyſicians, in regard to the different kinds of yellow fever, which appear, at different periods, in the Weſt-Indies. The ſimple truth, is, that in ordinary ſeaſons, when no peſtilential conſtitution of air exiſts, the fever of the Weſt-Indies, is not contagious. It attacks ſtrangers with violence and deſtroys life, but is not communicable *per ſe*. Hence the authors who have written on the ſubject are correct, in aſſerting this ordinary fever, not to be contagious.

But after catarrh has pervaded the hemiſphere, and during the increaſe of mortality in the Levant, in Europe and on the American continent ; that is, during a peſtilential ſtate of air, the fever of the Weſt-Indies aſſumes double malignity, and becomes contagious. In years of health, the diſeaſe rarely attacks natives of the iſlands ; but in unhealthy periods, not only native whites, but even blacks are ſometimes affected with the diſeaſe. Among theſe however it is leſs deſtructive.

Thus we ſolve the problem which has embarraſſed all the medical writers on the yellow fever, the moſt able of whom have been compelled to declare that the fever in the Iſlands is ſometimes contagious, and at other times, not.

This view of the ſubject would have prevented the trouble of authors who have labored to prove the diſeaſe imported from Siam, or the African coaſt.—Dr. Chiſholm, inſtead of attempting to trace the Grenada fever of 1793 to Africa, through the ſhip Hankey, had only to remark, the prevalence of the catarrh in 1790, of the plague in Egypt in 1791, and of the ſcarlatina in the United States in 1793, and he would have ſeen the beginning of a moſt extenſive and malignant ſeries of diſeaſes. The truth is, the peſtilential ſtate of air firſt manifeſted itſelf in Grenada in 1791, [the year it commenced in New-York] by new and ſingular ſymptoms, which ſurpriſed Dr. Chiſholm. And this, by the way, was before the beginning of the preſent war, on the part of Great-Britain, and of courſe, it could not be aſcribed to that circumſtance. The ſame fact, when juſtly conſidered, is demonſtration, that the diſeaſe was not brought from Africa.

It muſt be remarked however, that the fever of the tropical climates, though not contagious in ſporadic caſes, in healthful years, may at any time become epidemic and contagious, under certain circumſtances. Thus large bodies of ſoldiers and ſeamen, paſſing ſuddenly from high northern latitudes into the Weſt-Indies, may contract the diſeaſe, and render it ſo virulent by crouded camps and ſhips, as to render it very infectious. This is uſually the caſe in wars between England and France, which call great numbers of men from Great-Britain into the iſlands.

Yet even in this caſe, the mortality of the diſeaſe is increaſed by a peſtilential ſtate of air, concurring with ſuch local cauſes. Such was the ſtate of air from 1760 to 1763, during which the Britiſh and American troops periſhed before Havanna. Such alſo has been the ſtate of air for eight years paſt, in which the deſtruction of the Britiſh troops in the iſlands has been unparralleled.

This circumſtance has led a reſpectable college of phyſicians in Philadelphia, to inſinuate that war is a cauſe of the diſeaſe. Their words are, " it exiſts in the Weſt-Indies, particularly in time of war, when great numbers of ſtrangers are to be found there, and reference to dates will ſhow, that in *moſt* of the inſtances of the occurrence of the diſeaſe in the United States, there has been war in the Weſt-Indies." Memorial to the Legiſlature of Pennſylvania, Dec. 5, 1797.

This aſſertion, however, is not authorized by facts. The deplorable plague in Philadelphia and Charleſton in 1699, was in time of peace. That in New-York in 1702 was in the firſt year of a war, but could not have been derived from that circumſtance, in ſo ſhort a time.

The ſame diſeaſe at Barbadoes and Martinico, in 1723, was in time of peace, in Charleſton in 1728, in time of peace—at Carthagena the next year, in time of peace—at Charleſton and New-York in 1732, in time of peace—at Barbadoes in 1738 and 1764, in time of peace. The inſtances which happened between 1740 and 48, were in time of war, as was that in Philadelphia in 1762. The preſent war has exhibited melancholy effects of diſeaſes in the Weſt-Indies; but it is an indubitable fact that the plague of the preſent period commenced in 1791, a year before the war, and before numerous reinforcements of troops had been ſent to the iſlands. It muſt further be obſerved, that during the eight years war between America and Great-Britain, no yellow fever appeared in the United States ! a ſtriking fact.

It is certainly a moſt unfortunate circumſtance for the credit of the college of phyſicians, that the longeſt interval of peace during the preſent century, from the treaty of Utrecht in 1713, to the Spaniſh war of 1740, includes in it the longeſt and moſt ſevere ſtate of peſtilential diſeaſes, in Europe, Africa, America and the Iſlands, that has occurred, during the century. A ſimple inſpection of the bills of mortality, during that period, will demonſtrate the fact !

One thing, however, may be aſſerted with truth, that whatever may be the extent and violence of the bilious plague in the Weſt-Indies, it never has appeared in the northern parts of the United States, except in periods when a peſtilential or ſickly ſtate of the air is manifeſted by the prevalence of other epidemics. In tropical climates and in the ſouthern parts of America, particular circumſtances, as great bodies of freſh troops from northern latitudes, or unfavorable ſeaſons, may generate the diſeaſe in any year, however healthy in temperate latitudes. But from Maryland northward, this American plague has never appeared without being preceded by other epidemics. Let facts be reſorted to for confirmation.

We read of malignant diſeaſes in America, anterior to the year 1699, but the order of them is not deſcribed. The fatal plague of that year was preceded by epidemic catarrh, and the plague raged, at the ſame time, in the Levant. The ſame diſeaſe in New-York in 1702, belongs to the ſame period, which ſeems to have commenced in 1697 and ended in 1702.

The next ſickly period was from 1709 to 1713, beginning in Europe with the ſevere catarrh of 1709, which was followed by plague in the Baltic towns, in Hungary, Vienna, &c. accompanied with a moſt deſolating ſickneſs among horned cattle and horſes, in Germany and Italy. Of the effects of this conſtitution of air, in America, I have but two inſtances, which were a moſt diſtreſſing ſickneſs in Waterbury, in Connecticut, which almoſt depopulated the town, and epidemic meaſles in 1712.

Of the next peſtilential period, about 1720, I have alſo but two inſtances in America; the mortality at Duck creek, as already related, and the malignant pleuriſy in Hartford.

The plague in Philadelphia and Virginia in 1741, and in New-York in 1743, was preceded by the uſual epidemics, influenza, meaſles, angina, &c. and at the ſame time the plague was raging in the Levant and in Sicily.

The ſame diſeaſe in Philadelphia in 1762 had its uſual precurſors, meaſles and catarrh, and this occurred during the prevalence of the plague, in the Levant.

I hardly need to mention, in proof, the preſent epidemics. It is well known, we have paſſed through the whole ſeries of precurſors, catarrh, ſcarlatina, meaſles, &c. the two former being far more general and ſevere than uſual, indicated, with infallible certainty, the violence and extent of the plague which was to follow.

From a long ſeries of facts, then, we demonſtrate that the plague of our climate depends on ſome *general cauſe*. And it muſt abaſh and confound the ſticklers for the propagation of this diſeaſe from country to country by fomes, to know that the diſeaſe never occurs in the temperate latitudes of America, except under a peſtilential conſtitution of air, manifeſted by other malignant diſeaſes in this country, which are certainly *not* imported, and during alſo the prevalence of ſimilar diſeaſes in the Levant, and an increaſe of mortality in other countries. It muſt ſtill more confound theſe perſons, if they have any ſuſceptibility of conviction, to obſerve that theſe very peſtilential diſeaſes, inſtead of being conveyed from place to place, appear at one and the ſame time in Egypt, Turkey, the Weſt-Indies, and in the United States. This is very common, and probably is always the fact.

If the peſtilence were introduced into this country, from the iſlands, and if the diſeaſe is capable of being propagated as an epidemic, from fomes, why, let me aſk, has it never been propagated in the United States, in healthy periods? It has been *imported* probably in hundreds of inſtances, from the iſlands, ever ſince the commencement of the Weſt-India trade.

Not a year paſſed from 1763 to 1791, in which multitudes of ſeamen or peſſengers were not brought into the United States, into large and ſmall towns, and into hoſpitals filled with patients, with the yellow fever upon them and all their infected clothing. Yet in all this long period, no contagion appeared, altho no precautions, at leaſt in many parts of the country, were ever taken to prevent it. If the diſeaſe contains ſpecific contagion, ſurely that contagion muſt take effect under all circumſtances. Every man knows that the variolous matter of the ſmall-pox regards neither time nor place; its contagion acts in all years, ſeaſons and climates, tho not with equal certainty.

This fact alone, that the bilious plague never ſhows itſelf in the temperate latitudes of America, except when the current epidemics of this country, manifeſt a general conſtitution of air, unfriendly to health, is ſufficient to explain all the difficulties that have occured to medical men and to others, on the ſubject of the origin and peculiar ſymptoms of the diſeaſe.

Some of theſe remarks are in anticipation of the ſubject of another ſection, but they fall naturally enough under this head, the deſign of which is, to eſtabliſh the doctrin of the univerſality of certain diſeaſes, at particular times, occaſioned by a cauſe or cauſes extending often over a whole hemiſphere, and ſometimes over the earth.—That ſuch is the fact, is demonſtrated by the hiſtory of epidemics, from the earlieſt ages to this day. A ſucceſſive ſeries of ſimilar facts, occurring age after age, leave no room for cavil or controverſy.

I have confined my remarks, on this head, to the lateſt periods of the world, becauſe the evidence is more complete. But a ſimple inſpection of the preceding hiſtory, will convince any candid perſon, that the phenomena of peſtilence have been uniform, from the higheſt antiquity. In the moſt barbarous ages, when commerce was unknown, all the ſevere plagues appeared in almoſt every part of the earth, in high northern latitudes, and among ſavage tribes which had no intercourſe with the Mediterranean. The cuſtom of deriving all plagues from Egypt, Syria or Turkey by ſpecific contagion, is modern—it is pointedly contradicted by all hiſtory—is unworthy of the enlightened period in which it has been advanced—and marks an extreme degeneration in philoſophy.

SECTION XV.

Of the phenomena which attend peſtilential periods, with conjectures concerning the cauſes.

IT will not eſcape the moſt inattentive reader of the foregoing hiſtory, that all the violent and general plagues have been preceded or accompanied with remarkable phenomena in the phyſical world, as comets, earthquakes, exploſions of volcanoes, and others of a ſubordinate kind.

We are to admit, with great caution, the influence of the planets in producing the calamitous diſeaſes which at periods afflict mankind. It is an influence very uncertain and undefinable. It is not indeed unphiloſophical to ſuppoſe, the ſeveral immenſe orbs that compoſe the ſolar ſyſtem, to have an influence on each other by means of the great laws of attraction and repulſion. The contrary ſuppoſition would be moſt unphiloſophical. But it might be very difficult to aſcertain preciſely what that influence is, becauſe it might not be poſſible to ſeparate its effects from thoſe which are produced by other cauſes.

The ancients went much too far in aſcribing events on this earth to planetary influence. They aſcribed not only natural, but moral effects to that influence, and by their extravagant ſyſtem of judicial aſtrology, brought into contempt the ſtudy of the influence of heavenly bodies.

We are not however to diſcard all conſiderations of ſuch an influence. We are naturally led to ſuppoſe that all parts of our ſyſtem are connected by principles of attraction, and that a certain order and equilibrium are neceſſary to keep all parts in due harmony. It is very obvious that the moon has a moſt material influence in regulating the ſeaſons and changes of weather on this globe, eſpecially the weekly and monthly viciſſitudes. The more diſtant bodies may have a ſimilar effect, tho leſs obvious.

Comets, which approach and enter the ſolar ſyſtem at certain unequal periods, may alſo have ſome influence upon the ſeaſons. To aſcertain this point, I have collected all the information my reading has enabled me to diſcover.

The ancients believed theſe bodies to be the cauſes or at leaſt the harbingers of peſtilence; according to that line of Claudian

"In cœlo nunquam ſpectatum impuné cometam."

"A comet in the heavens is never beheld with impunity."

But ſhould the fact be admitted, it might be ſtill a ſubject of enquiry, by what means theſe erratic bodies injure the health of mankind. That they have ſome effect of this kind, ſeems to be very probable, not only from the opinion of the ancients who were careful in their obſervations, but from the very uniform coincidence of their appearance with extenſive peſtilence.

It is certain that comets have a very ſenſible effect on the weather. This was obſerved as long ago as the days of Ariſtotle, who remarks, Meteorol. lib. 1. ca. 7. "That comets denote great tides and winds." He inſtances the ſwell of the ſea when Achaia was inundated, which was during the appearance of a comet. Pliny makes a ſimilar obſervation. "Ventos autem ab iis graves æſtuſque ſignificari." Nat. Hiſt. lib. 2. ca. 25. Seneca was of the ſame opinion, and he mentions ſtorms of rain alſo among the effects of their approach. Seneca, Nat. Quſt. lib. 7. ſect. 28.

It is true that great heat and drouth, and violent tempeſts mark the periods of the approach of comets, and it is equally true that the winters of the ſame periods are remarkably cold. Ariſtotle himſelf mentions the cold of the winter, during the appearance of the great comet, when Ariſtæus was archon at Athens.

The preceding relation of facts furniſhes a confirmation of theſe opinions. All the comets which have approached this earth, in their paſſage to or from the ſun, eſpecially thoſe which have paſſed very near us, have been preceded, attended and followed by moſt extraordinary effects, as great heat and drouth, in ſummer, and ſevere cold in winter ; deluging rains, violent tempeſts and unuſual tides. Theſe we may conſider as the conſtant and certain attendants on comets They occur ſo uniformly with the appearance of thoſe bodies, and for ſome months preceding and following, as to leave no room to queſtion the influence from which they proceed.

Through the medium of ſuch great changes in the ſeaſons, we may rationally ſuppoſe comets muſt affect the health of mankind. Extreme and unuſual heat ſeldom fails to produce a multitude of autumnal diſeaſes, as may be ſeen by the bills of mortality, and as the obſervations of every perſon can verify.

It is obvious from the foregoing hiſtory, that one of the moſt certain effects of the approximation of a comet, is, a moſt ſevere winter. The almoſt uniform coincidence of theſe two phenonena leaves us no room to doubt their connection. Now it is a law of the ſeaſons, that the mean temperature of the air is nearly the ſame every year. This has been proved by ſeven years obſervations made at Salem by Dr. Holyoke, and publiſhed in the firſt part of the ſecond volume of the Memoirs of the American Academy. Whenever therefore the cold of winter is long or ſevere in an unuſual degree, it muſt be counterbalanced, in the ſucceeding ſeaſons, by an extraordinary degree of heat. This may happen to be effected by long mild weather in ſpring and autumn ; but it is more uſual, that ſevere winters are followed by exceſſive heat in the ſummer months. In this caſe, the human body never fails to ſuffer. In ſuch ſummers, bilious fevers and dyſenteries are commonly numerous and violent.

If therefore comets do in fact produce unuſually cold winters, which are neceſſarily preceded or followed by exceſſively hot ſummers, they may be conſidered as the remote cauſe of numerous diſeaſes.

But comets do moſt evidently occaſion at times exceſſive drouth ; and at other times, extraordinary quantities of rain ; and theſe intemperate ſeaſons not unfrequently ſucceed each other within a few months. No man can queſtion this fact, who attends to the preceding hiſtory. All ſuch unuſual ſeaſons are apt to injure the vegetable kingdom. In too dry ſeaſons, corn may be defective in quantity; in too wet weather, it is deficient in nouriſhing qualities; and in both caſes, it may contain the germs of epidemic diſeaſes.

That comets ſhould affect the health of mankind in any other way, than through the means of the ſeaſons or weather, is poſſible; but is not to be admitted without moſt indiſputable evidence. It is indeed certain that the oriental nations believe, and have, from high antiquity, believed theſe bodies to be the forerunners of plagues; and the enumeration of facts in the foregoing hiſtory, evidently confirms their opinions. That hiſtory is probably defective in accounts of comets; but imperfect as it is, it affords proof that moſt of the plagues which have been extenſive and ſevere, have been preceded or attended with the approach of comets.

From numerous facts in the hiſtory of peſtilence, I am led to ſuſpect that comets have ſome effect on the fire or electricity which ſurrounds and penetrates this globe. One of the moſt certain, as well as moſt remarkable phenomena, which attend plagues, is, earthquakes; and in general, the more ſevere or numerous have been the earthquakes, the more violent and deſtructive the plagues. This remark applies to moſt of the countries in Europe, where the plague has been epidemic; but is more eſpecially true of Italy and the Syrian coaſt, with the whole of Aſia Minor.

In confirmation of this remark, we need not reſort to facts in ancient times, when earthquakes ſeem to have been more frequent and violent, than in modern times. Within the preſent century, the ſhocks which have uniformly attended peſtilence, leave no room to queſtion that ſome connection exiſts between the two phenomena.

Now it is a fact that will appear from an inſpection of the preceding hiſtory, that, during the approximation of comets to our ſyſtem, earthquakes have been moſt numerous, general and violent. A great proportion of the tremendous eruptions of volcanoes have happened during the ſame periods. To prove this, we need not go back to the terrible concuſſions and violent diſcharge of Etna, which cloſed the long peſtilence in Athens, in the fifth and ſixth year of the Peloponneſian war—nor to the dreadful earthquakes and eruption, which preceded the deſtructive plague in the reign of Titus. We have ſimilar facts in modern times. The plagues in the Levant in 1743, and eſpecially in Meſſina, were accompanied or preceded by violent earthquakes and a comet. The extenſive plague of 1760, was attended with all the great phenomena—comets, eruption of Veſuvius and tremendous earthquakes. The peſtilential periods of 1770 and 1783, were introduced by the ſame phenomena.

Theſe facts afford ſtrong evidence that the approach of comets, not only influences the weather, but alſo calls into action the ſubterranean fires. By what means thoſe erratic bodies produce this effect, may be a curious queſtion. That the internal fires explode at times, without the attractive powers of comets, is undoubted; but the concurrence of earthquakes and violent diſcharges from volcanoes, during the appearance of comets, or near the time, ſeems to render it certain that thoſe bodies have a moſt powerful effect on the element of fire which is diffuſed through the globe and the ſurrounding atmoſphere.

Many authors have obſerved the connection between comets, earthquakes and peſtilence, but ſeem not to have included volcanic eruptions among the cauſes of diſeaſe.

" In cœlo per quindecem dies apparens crinitum ſidus ſiccatis plane terris attulerat; ſays Paulus Jovius; peſtilentia quoque contagiis ſerpens, et in urbe et in Caſtris." Hiſt. vol. 2. 111.

This obſervation of the writer is well founded—comets ſeldom fail to occaſion a univerſal defect of rain and ſprings in ſome countries, and peſtilence marches in the train with its other effects.

" Inter prognoſtica peſtis eſt etiam cometes, jaculum et aliæ figuræ ardentes, diutius in ſuprema aeris regione ſubſiſtentes." Horſtius from Angelus Sala, de peſte, p. 253.

Theſe remarks alſo are juſtified by our own obſervations. They were remarkably verified in the comet, the meteor and the brilliant halo which marked the commencement of the laſt ſeries of epidemics in 1788 and 1789.

Riverius is expreſs to the ſame point. He aſſerts that comets never appear without being followed by epidemic and peſtilent diſeaſes, and various changes in the phyſical world. He inſtances that of 1618, in his own days. The obſervation is verified by the teſtimony of all ancient writers and by a uniform ſeries of modern facts.

The order of events is exemplified in the epidemic periods of 1769—and of 1782. In the firſt period, exceſſive drouth during the approach of the comet in 1769—failure of crops—famin and plague and inſects in 1770—volcanoes, earthquakes and tempeſts in 1770 and 1771—catarrh and meaſles in 1772—then, for ſeveral years, anginas, putrid fevers and dyſenteries.

In the period of 1781 and 2, catarrh began the epidemics—in 1782 a univerſal failure of water, and of crops in India and Egypt—in 1783, volcano, famin, meaſles, angina and plague—1784 a comet, followed by tempeſts, &c.

Earthquakes conſtitute a part of the viſible effects of the general cauſe which produces peſtilence.

It has ſometimes happened that in theſe convulſions of the earth, a vapor has been extricated which has produced immediate diſeaſe. The great earthquake in South-America in 1730 was ſpeedily followed by a peſtilential fever. The deſtruction of Port-Royal in Jamaica in 1692 was ſoon ſucceeded by a mortal fever in all parts of the iſland; and the univerſality of the fever would lead us to ſuſpect that vapor, in this inſtance, could not have been the cauſe. At Venice in 1343, the plague ſoon followed an earthquake.

In the year 615, violent earthquakes in Italy were followed by "lues elephantiæ." Baronius, vol. 8. 243. Baglivus relates that the great earthquakes in Italy in 1703, were ſucceeded by numerous diſeaſes, eſpecially opthalmia, eryſipelas, meſenteric fevers and double tertians. In autumn, the ſmall-pox became epidemic, apoplexies were frequent and ſudden deaths almoſt daily. / With reſpect to apoplexies and ſudden deaths after earthquakes, we have alſo the authority of Seneca.

Baglivus further remarks "poſt terræmotus frequenter ſuccedunt peſtilentia, vel morbi graves et epidemici, imo nova et inaudita morborum genera." p. 530. The idea that new and unknown ſpecies of diſeaſes follow earthquakes, if well founded, leads us to ſuſpect that the changes in the characters of diſeaſes are attributable to the various action of the electrical fluid.

The terribly deſtructive earthquakes in Naples and Sicily in 1693, were ſpeedily followed by malignant fevers, tertians accompanied with delirium and lethargy, and the ſmall-pox which was very fatal to children.

Baddam's Mem. vol. 3. 91.

" Frequent earthquakes, ſays Fracaſtorius de contagione, p. 136, announce future peſtilence, and by means of exhalations, tend to produce it." Van Swieten agrees in this opinion.

Seneca aſſerts, Nat. Queſt. art. 27, that peſtilential diſeaſes uſually follow great earthquakes. He ſuppoſes the air, encloſed in the earth, to become vitiated, either by ſtagnation or through the defect of the internal fires " internorum ignium vitio." He thinks this air when forced into the atmoſphere, renders it impure and unwholeſome, generating new kinds of diſeaſes. He reaſons by analogy that as water corrupts by ſtagnation, ſo will air. Hence after earthquakes, " ſubitæ continuæque mortes et monſtroſa genera morborum, ut ex novis orta cauſis—nec prius peſtilentia deſinit, quam ſpiritum illum gravem exercuit laxitas cœli, ventorum jactatio."

This opinion of Seneca is certainly entitled to reſpect, and has been followed by many diſtinguiſhed authors, Van Helmont, Van Swieten, Sydenham, Hodges, Baglivus and others.

But I ſuſpect the modern diſcoveries will enable us to furniſh a more rational ſolution of the phenomenon. I am inclined to believe that a ſuperabundant ſtimulus, occaſioned by the ſhock of an earthquake, and an atmoſphere ſurcharged with electricity, will more rationally account for the apoplexies, ſudden deaths, ſmall-pox and malignant fevers. If a deleterious vapor were the cauſe, I ſhould ſuppoſe its effects would be ſpeedy, and its force ſoon expended, the atmoſphere being ſpeedily purified by winds. But, if ſtimulus is the cauſe, it may exiſt for a long time in the atmoſphere, and the human body not yield to its force in many weeks or months. This would better accord with facts, for altho diſeaſes appear ſoon after an earthquake, yet the worſt effects are often many months or a year after, as was the caſe in the reign of Titus, when the peſtilence was the year after the earthquake and eruption of Veſuvius.

There are however many authorities in favor of the vapor. Seneca relates that a vapor cauſed by an earthquake in Campania, deſtroyed ſix hundred ſheep. Van Helmont ſays that "popular plagues do draw their firſt occaſional matter from an earthquake." Page 1125.

The fact that a viſible vapor, without an earthquake, ſometimes appears ſuddenly in a place and evidently produces diſeaſe, is a ſtrong confirmation of Seneca's opinion. A memorable example happened at Rouen, in 1753, as related under that year. Foreſtus relates that an epidemic catarrh or ſore throat, in Alemar, A. D. 1557, ſuddenly invaded 2000 perſons, of whom 200 died. He aſcribes it to a vapor, for the diſeaſe was preceded by thick clouds of an ill ſmell.

See Van Swieten, vol. 16. p. 31.

Mazeray relates that the black peſtilence of 1347 aroſe in China from a vapor, which burſt from the earth with a ſmell moſt horribly offenſive. This fact is cited by Boyle vol. 5. 60. in proof that peſtilential diſeaſes ſpring from vapors evolved from the earth. This author ſuppoſes new diſeaſes may be generated by vapors, and remarks further that countries abounding with cinnabar eſcape the plague.

But it ſeldom happens that peſtilential diſeaſes can be traced directly to earthquakes. On the other hand, altho great plagues are almoſt invariably accompanied with ſhocks of the earth, yet it more uſually happens that the peſtilence appears before the concuſſion. Thus the ſhocks which alarmed and laid waſte Italy in 1348, 1349 and 1350, were preceded by the dreadful plague of 1347.

Sometimes the earthquakes precede the plague, but more generally the peſtilence appears firſt, or at leaſt the petechial or other malignant fever, which marks the commencement of the peſtilence. Thus the plague of 1760 was preceded by a ſpotted fever in 1759, which marked the approach of the calamity; which ſpotted fever appeared in Syria, *before* the terrible earthquakes of that period.

In the well known plague at Oczakow in 1738 and 39, an earthquake happened about the time the diſeaſe began to abate. Van Swieten, vol. 16. 47. Such was the fact in the days of Thucydides. Numerous obſervations on theſe phenomena lead me to ſuſpect, that the electricity which is to produce the exploſion, is in action for a conſiderable time *before* the ſhock, and that it is this *previous action* which occaſions epidemic diſeaſes. That is, the ſtimulus of fire or electricity produces ſenſible effects on the bodies of animals the more ſuſceptible objects, before it does on the leſs ſuſceptible ſubſtances in the bowels of the earth.

The earthquakes do not always occur in the ſeat of the peſtilence. I find no concuſſion mentioned to have happened at London in 1665, or in the years next preceding or following; but ſhocks were experienced in the neighboring counties in 1665, and 1666.

This ſeems to have miſled the able Diemerbroeck, who, in reaſoning on the cauſes of the plague, objects to the influence of earthquakes, becauſe no ſhocks occurred at Nimeguen, before the peſtilence of 1636. It is probably true that earthquakes are not uſually the *cauſe* of the plague; but that they have ſome connection with the cauſe, I can hardly doubt. The miſtakes of Diemerbroeck and others on this point ſeem to have ariſen from conſidering the plague as an iſolated diſeaſe, and as depending on a cauſe local and temporary; whereas a juſt view of the ſubject muſt comprehend all the diſeaſes of increaſed malignity which precede the plague, very often for two or three years. Such a view alſo muſt include, among the cauſes of the diſeaſe, the agitations or derangement of the elements in remote parts of the country. Thus, altho no earthquake was experienced at Nimeguen, about the time of the plague, yet a ſevere ſhock was felt at Lauſanne in 1634.—Keyſler's travels 190. This marked ſome general action of internal fire, which, tho it might not explode ſo as to ſhake all Germany, might have produced effects, by means of an inſenſible vapor or ſtimulus, in all parts of Europe. Certain it is, that for the period between 1631, the year of the tremendous eruption of Veſuvius, and the year 1637, all Europe was afflicted with mortal epidemics. The philoſopher who would obtain juſt views of the cauſes, muſt extend his inquiries to all the great phenomena, which occurred during this whole period, in all Europe at leaſt, if not in the American hemiſphere; for ſuch a view only will comprehend the whole extent of the peſtilential ſtate of the atmoſphere.

It muſt not be forgotten, that during this period from 1633 to 1637, when the plague or other deſolating diſeaſes, ſpread over both hemiſpheres, Etna was in a continual ſtate of eruption; as it was for fifteen years, during the peſtilential conſtitutions deſcribed by Sydenham in his days.

In looking over the liſt of comets, and the hiſtory of earthquakes, I am compelled to believe the approach of comets to have no ſmall influence on the electricity and ſubterranean fires of the globe. Such a vaſtly great proportion of the violent concuſſions of the earth have happened, within a few months of the appearance of comets, that no reaſonable man can ſuppoſe the coincidences to be the reſult of accident.

Equally remarkable have been the coincidences in time between the appearance of comets and the exploſions of volcanoes. And this fact is no trifling confirmation of my opinion, reſpecting the influence of comets in producing earthquakes; for earthquakes and eruptions of volcanoes are often cotemporaneous.*

* It is not only during the *appearance* of comets, that their effects are perceived in the elements, but for many months *before* and *after*. I can teſtify from careful obſervations that the effects of that in Auguſt 1797, were very obvious, in anomalous tides, as early as the laſt week in May; and the inundations in England during the autumn and winter following, ſhow its effects ſeveral months after its departure. The whole hiſtory of comets and their effects warrants this concluſion. Seneca made this remark ſeventeen centuries ago. Theſe are his words. "Ariſtoteles ait, cometas ſignificare tempeſtatem et ventorum intemperantiam atque imbrium.—Non ſtatim cometes ortus ventos et pluvias minatur, ſed *totum annum ſuſpectum facit*.—" Ariſtotle obſerves that comets indicate ſtorms and violent winds and rain.—Theſe effects however do not immediately follow their appearance, but are to be expected, during the whole year." He then mentions that ſuch was the fact, with the comet predicted by Ariſtotle and Theophraſtus, and which appeared in the conſulſhip of Paterculus and Vapiſcus. Nat. Queſt. lib. 7.

I would further obſerve that comets move in trajectories of an eliptical or parabolic form, the ſun being ſituated in one of the foci. The time when we obſerve them is when they paſs this part of the ellipſis. Now according to the univerſal law of planets, by which they deſcribe equal areas in equal times, their motion muſt be moſt rapid when neareſt the ſun, and within our ſight. Before their appearance, and after

I cannot however admit, that the exploſions of ſubterranean fires, are the direct exciting cauſe of peſtilential diſeaſes. It is indeed aſcertained, beyond all queſtion, that periods of extenſive peſtilence and mortality are remarkable for earthquakes and eruptions of volcanoes. But the exploſions of fire do not ſo generally *precede* epidemic diſeaſes, as to authorize the ſuppoſition that they *produce* thoſe diſeaſes. Earthquakes occur, during the prevalence of peſtilential or other mortal epidemics, but in the midſt of the period, or ſometimes at the concluſion.

Hence I deduce an opinion, that peſtilence and earthquakes depend on one common cauſe ; which excites into action the internal fires. But I ſuppoſe the action or fermentation may precede, for months and even years, the exploſion in earthquakes and volcanoes and by means of an inſenſible vapor, or heat or electrical diſcharges, the elements of water and air may be eſſentially affected, in ſuch a manner as to impair the principles of animal and vegetable life. Whether this is a juſt explication of the cauſe, may be a queſtion ; but ſo many phenomena concur to authorize it, that I cannot withhold my aſſent to the general principle.

The ſame effect perhaps may be produced by the exceſſive action of mere ſtimulus upon the animal ſyſtem, without the infuſion of a deleterious vapor into the air.

A remarkable evidence of the effects of fire or electricity on the earth and air, before its exploſion, is the extreme drouth which is often experienced over whole continents or the

their departure, their movement is ſlower, than when within the ſolar ſyſtem, and they may be near the earth, many months before they enter the ſyſtem or become viſible. Hence their influence on the earth ſo long before and after their appearance.

It is further to be obſerved that many comets doubtleſs enter the ſyſtem and paſs round the ſun without ever being ſeen, and ſuch as come from regions of ſpace directly oppoſite to the earth, muſt be *inviſible*, unleſs we can ſee them in the ſplendor of the ſun's rays. This remark is as old as Seneca and older. He relates an inſtance, in which Poſidonious diſcovered a comet, in the darkneſs of a ſolar eclipſe, which would not have been ſeen, had not the eclipſe happened. Lib. 7. ſect. 20.

Newton and Halley have made the ſame remark. Hence perhaps we may account for violent ſeaſons, like the ſevere winter of 1780, which happened without the appearance of any comet. This is mere conjecture.

whole world, for ſix and even twelve months antecedent to a great eruption of volcanoes.

In confirmation of my principle, that the changes in the elements producing epidemic diſeaſes, are effected by the all-pervading action of electricity, the uſual appearance of meteors or celeſtial lights, in peſtilential periods, muſt be mentioned. For the truth of the fact, we have ample proofs in every age. The inſtances of meteors or other celeſtial appearances of fire, which are recorded of peſtilential periods, are ſo numerous, as to leave no room to queſtion the connection between the cauſe of peſtilence, and the fire that belongs to the ſyſtem. Sometimes theſe fiery appearances are ſtationary lights in the ſky, which the frightened imaginations of men have formed into armies ready for combat, and conſidered as the preludes of bloody battles. Sometimes the heavens have been filled with thoſe ſmall meteors, called falling or ſhooting ſtars. At other times immenſe globes of fire have traverſed the celeſtial regions, and burſt with a tremendous report.

During a plague in Vienna in 1679, ſays Van Swieten, vol. 16. p. 19. from Sorbait, ſeveral bluiſh fiery balls were ſeen in the air, ſome of which fell and ſenſibly increaſed the heat.

In October 1709, when the plague was in Dantzick, a blue fiery globe came from the north weſt and ſhot over the town with amazing celerity, illuminating the town and falling at the ſouthward.

Baddam's Memoirs, vol. 6. 14.

During the plague in Philadelphia in 1793, about the 12th of September, a meteor fell between the city and the hoſpital.

Ruſh. p. 108.

During the extreme heat which introduced the peſtilence of the laſt ſummer, 1798, about the 9th of Auguſt, the ſmall meteors or falling ſtars were incredibly numerous, for ſeveral nights. They almoſt all ſhot from the north-eaſt to the ſouth-weſt, and ſucceeded each other ſo rapidly as to keep the eye of a curious ſpectator almoſt conſtantly engaged.

Diemerbroeck remarks that during the ſummers of 1635 and 6, at the time of the ſevere plague in Holland, there was a vaſt number of ardent ſtars, gliding through the celeſtial regions and falling to the earth. "Stellarum ardentium in Cœlo oberrantium magnus concurſus, et in terram prolapſio." He mentions likewiſe almoſt continual flaſhes of light, in a ſerene ſky, or ſilent lightning.

Livy mentions that the heavens appeared to be in a flame, previous to the ſevere peſtilence of the year 290 from the building of Rome.

A flame in the heavens is noted under the years, 733, 742 and 788, all which were peſtilential. This flame is not deſcribed, and whether it was of the ſpecies of Aurora Borealis, which extended over the celeſtial region, or of that ſpecies of light, or yellowiſh red colour, which diſtinguiſhes our modern *dark days*, cannot perhaps be determined. But a curious phenomenon of this kind happened in the ſevere winter of 1741, which was too remarkable to be paſſed over in ſilence; eſpecially as it may poſſibly explain what Livy and many other hiſtorians have recorded, that at certain times, "it rained blood." The aſſertion is often found in hiſtorians of credit, and has by the moderns, been numbered among the extravagancies of popular credulity. But an appearance which would warrant ſuch an aſſertion occurred in this country, and is ſtill recollected by old people.

In the month of January 1741, in the midſt of one of the coldeſt winters of this century, there was a little relaxation of the rigorous cold, during which the heavens were overcaſt with clouds and a little rain fell. Late at night, during this falling weather, the heavens appeared all in a flame, ſo bright as to illuminate the earth and render objects every where diſtinctly viſible. Many people ſaw it and were alarmed, ſuppoſing the great day was at hand. The rain which fell during this light, had preciſely the appearance of drops of blood diſtilling from the clouds.

This relation is taken from my father, who was then nineteen years old, and recollects all the circumſtances more minutely than the events of the laſt year.

The well known dark day in May 1780, was diſtinguiſhed by a ſimilar light in the heavens; but not occurring in the night, it was leſs an object of wonder.

I ſtrongly ſuſpect a ſimilar phenomenon will account for thoſe paſſages in many hiſtories, which ſpeak of raining blood, and enable us to do juſtice to the veracity of the writers.

Appearances of this kind have uſually occurred in periods of peſtilence, when the imaginations of men have been ſubject to alarm; and they have often happened during extraordinary ſeaſons. The light of 1741, was during a moſt ſevere winter, and in the moſt ſickly period, that has occurred this century. See the London bills of mortality. In America, that winter was followed by peſtilential diſeaſes.

The dark day of 1780, was on the opening of ſpring, after a moſt ſevere winter, and altho that year was not ſickly in general, yet in the year following, we had an epidemic catarrh, ſucceeded by a ſeries of epidemic diſeaſes of other kinds. It is remarkable too that on that very day began a violent eruption of mount Etna.

In 1716, in the month of October, happened a dark day; this was after a moſt ſevere winter in Europe. I have no account of the ſeaſons in America, but the next winter was unuſually ſevere, and ſnow fell in extraordinary quantities.

On the 9th of Auguſt 1732 happened another dark day. This was followed by earthquakes, a ſevere winter and univerſal catarrh.

The 19th of October 1762 was equally remarkable for darkneſs, with the phenomenon of a red, or yellowiſh tinge in the heavens, which gave to the ſun, when it appeared, the color of blood. Some rain fell during the day, and the water was of a dirty ſulphurous ſmell. There had been two earthquakes, with epidemic catarrh, in America in 1761. In the ſame year with the darkneſs, 1762, the catarrh was epidemic in Europe; and the winter of that year was exceſſively ſevere in both hemiſpheres. A comet appeared in 1762 and an eruption of Etna followed the ſevere winter, in 1763. There were earthquakes alſo in Aſia in 1762. Who can doubt that the vapor, occaſioning ſuch darkneſs, is the effect of the agitation of the fire of the globe?

Similar inſtances of extraordinary darkneſs have occurred in every age. They are mentioned in the years before Chriſt 366 and 295—and of the Chriſtian era 252, 746, 775, and in many other periods. And the reader will obſerve, this darkneſs is cotemporary with peſtilence, in almoſt every inſtance. During the plague of 746, the darkneſs was of ſeveral days duration—in 252 it was of three days, and in 775 of ſix days continuance. A ſimilar darkneſs accompanied the peſtilence in Egypt, in the days of Pharaoh. Many other inſtances have been mentioned in the preceding hiſtory.

In America, it has been cuſtomary to aſcribe this unuſual appearance to condenſed volumes of ſmoke, after the burning of immenſe tracts of woods in the weſtern parts of the country. But I cannot learn that any great fires have uſually preceded theſe dark days; and negative evidence, in ſo many inſtances, amounts to proof that no great foreſts have been burnt. Beſides, the ſame phenomenon has been often obſerved, in countries where there were no foreſts, as in Italy, Syria, Aſia Minor and Egypt, and eſpecially in England.

That the ſmoke of burning foreſts cannot be the cauſe may be rendered very certain by theſe conſiderations. Firſt, the cauſe is not equal to the effect. Had the woods from the 40th degree of latitude in America to the 50th been all conſumed in a day, the ſmoke would not have been ſufficient to cloud the ſun over the territory covered by darkneſs on the 19th of May. Any perſon may judge of this who has ſeen large tracts of foreſt on fire. That thirty or forty miles of burning foreſt, ſhould cover five hundred miles with impenetrable darkneſs, is too abſurd to deſerve a ſerious refutation.

In the ſecond place, the color of ſmoke, when elevated into high regions of the atmoſphere, is very different from that of the vapor which cauſes the darkneſs on all ſuch occaſions.

But what decides this queſtion is the lightning, thunder and rain, and eſpecially the meteors that accompany theſe clouds of vapor. As far as I can learn, ſome or all of theſe phenomena attend dark days. Thunder was heard on the morning of the 19th of May, in moſt places. Mem. Am. Acad. vol. 1. 238. Violent thunder ſqualls and a meteor followed the great darkneſs in Canada in 1785. Theſe phenomena demonſtrate that the clouds, on ſuch occaſion, have a connection with electricity. This is further evidenced by the ſmell of ſulphur, in the water that falls, and the ſcum that is left on objects—ſmoke would not produce either; nor would the largeſt volume of ſmoke ever raiſed into the air, ſpread over an extenſive region, a denſe ſubſtance that ſhould become viſible and tangible on the earth. Beſides this darkneſs or vapor ſometimes occurs in winter, when the earth is covered with ſnow.

When we connect with theſe facts, the circumſtance that theſe dark days always occur, during or near the time of volcanic eruptions, earthquakes, or the unuſual ſeaſons which accompany peſtilence and epidemic dieaſes of other kinds, we ſhall be at no loſs to charge them to the account of the central fires, or the diſcharges of electricity. This accumulation of vapor is not a more ſurpriſing phenomenon, than the ſudden change in the properties of the atmoſphere which produces univerſal catarrh.

Hodge, who wrote on the plague of London, and who appears not to have been rewarded with celebrity equal to his merits, ſuppoſes the cauſe of peſtilential diſeaſes to be a ſubtle aura, or vapor exhaled from the bowels of the earth, which has, by too much heat and humidity, loſt its wholeſome qualities. He ſays, in proof of his opinion, that a given quantity of earth, infuſed into water in ſpring, depoſits more ſalt than at another time of the year.

His idea ſeems to be not very different from that of Van Helmont, who ſuppoſes the cauſe of peſtilence to be a gas or air, which has *putrified by continuance*, as the tranſlation is; by which is meant, probably, a ſtagnation in the earth.

The doctrin of an inſenſible vapor, infuſed into the atmoſphere from the bowels of the earth, may perhaps be thought wholly conjectural. But there are ſome phenomena which can hardly be reſolved without reſorting to the action of the electrical fluid. The ſudden changes of weather cannot be accounted for, in all caſes, by changes in the winds. Indeed the moſt reflecting philoſophical men acknowledge themſelves puzzled to aſſign reaſons, for many of the rapid tranſitions from heat to cold and from cold to heat. It has been ſuggeſted, that the heat may aſcend and deſcend in the atmoſphere, by means of phyſical laws, to us unknown; but this ſuppoſition is not ſupported by any clear proofs, perhaps not by rational probabilities.

There are many reaſons which incline me to believe that the principle of fire, the moſt ſubtle, penetrating, active fluid in creation, and unqueſtionably the moſt powerful agent in all the movements of matter, paſſes more frequently and rapidly from the earth into the atmoſphere and vice verſa, than is commonly imagined. I ſuſpect that an intimate connection ſubſiſts in this reſpect, between the interior of the globe, and the atmoſphere which ſurrounds it.

To the rapid paſſing of heat from the earth to the air, and from the air to the earth, we may perhaps aſcribe many of the amazing changes which take place in the temperature of the air, in a few hours, and often without a change of wind. The increaſe and the moderation of cold are ſometimes very obvious, long before the change of winds to which we uſually aſcribe ſuch changes; and I ſuſpect that the changes of winds are more frequently the *effect*, than the cauſe, of a change in the temperature.

But there are ſome appearances, in the atmoſphere, previous to ſhocks of earthquake, which demonſtrate a cloſe connection between the atmoſphere and ſubterranean fire. A remarkable one in this country, and generally in others, is a univerſal ſerenity and tranquillity in the atmoſphere. The ſky is cloudleſs, and all nature, if at night, is wrapped in profound ſilence. This phenomenon is too uniform a precurſor of earthquakes, to be deemed an accidental circumſtance. It muſt be an effect of ſome connection between the air above, and the cauſe of earthquakes.

It is remarkable alſo that ſeamen ſometimes obſerve a ſwelling of the ocean, without wind, and before any ſhock of the earth; and this fact, Pliny mentions among the ſigns of an approaching earthquake.* The ſame author mentions a well known fact that ſometime before the concuſſion, birds appear to be greatly agitated, and retire. In Italy, a common prelude of an earthquake is, a thin white oblong cloud or vapor, nearly reſembling the color of wool. This ſign was ſeen for ſeveral days in the year 1702, before the earthquake. The ſame was obſerved by Caſſini in 1668, in the ſame part of the heavens, the ſign of the whale.

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* Is not this ſwelling of the ocean, previous to an earthquake, analagous to the tides? May not both be aſcribed to the force of electricity; the ſwell of the water preceding earthquakes being irregular, as depending on no regular viſible cauſe; and the tides being more regular, as being the effect of the moon's influence on the electrical principle. This idea ſeems to derive ſome ſtrength from the known fact that earthquakes

See Pliny, lib. 2. 81. Baglivus, page 543.

The evening before a violent earthquake in Sicily in 1693, a bright flame was obſerved, apparently about a mile diſtant from the ſpectator ; this flame vaniſhed as ſoon as the ſhock occurred.* The day ſucceeding the firſt ſhock, the ſky was darkened, and tinged with a deep yellow. This was the preſage of a moſt tremendous concuſſion, which demoliſhed many towns in Naples, Sicily and Malta,

Seneca relates that a violent earthquake in Campania, altho in winter, was preceded by a calm of ſeveral days duration.

Nat. Queſt. lib. 6. 12.

For ſometime before the great earthquake in Italy in 1638, the air was perfectly calm, and the heavens ſerene, but the ſea was covered with little bubbles, as if agitated by drops of rain.

The phenomena that occurred in Germany and Holland, on the day, but *not at the hour* of the tremendous earthquake

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uſually happen in periods of the moon's revolution, when that orb exerts its greateſt influence on the earth. From numerous calculations, it appears that earthquakes uſually occur near the moon's perigee or apogee or the change or conjunction of ſun and moon ; generally about three days before or after the conjunction—this, by the way, is the very time when epidemic diſeaſes uſually invade the patient, or come to fatal termination, according to the remarks of all modern phyſicians —a ſingular fact that may lead to important concluſions.

In a few inſtances, earthquakes happen near the full moon—the other poſition in which that ſatellite exerts more than her ordinary influence on the earth.

Let theſe facts be compared with the occurrence of violent tempeſts about the ſame time of the moon's revolution, the invaſion of epidemic diſeaſes and the full tides.

A ſtrong confirmation of this opinion is derived from the ſwelling of the ſea, juſt before a hurricane in the Weſt-Indies. There is a viſible intumeſcence, before the atmoſphere is clouded, or the leaſt breeze of wind. What can be the cauſe, but the electrical fluid which is paſſing from the earth to the atmoſphere, and is ſpeedily to produce moſt tremendous effects. See the Addenda.

* A ſimilar light was ſeen at Derby in Connecticut, in the evening preceding a local exploſion of fire, about thirty years ago.

which demoliſhed Liſbon in 1755, were very remarkable. The water was violently agitated, buoys were broken from their chains, large veſſels ſnapped their cables, ſmaller ones were thrown aſhore, boats in canals were forced from their faſtenings, chandaliers vibrated in the churches, water in ſmall veſſels was agitated and daſhed over the ſides ; and all this without any ſenſible motion of the earth or buildings.

See Encyclopedia, art. Earthquake.

Theſe phenomena indicate a connection between the atmoſphere and the ſubterranean fire, which is altogether inviſible, and to men, imperceptible. We perceive nothing, before the ſhock but univerſal ſerenity and calm ; but the delicate ſenſes of the fowls of heaven are affected ; they fly about in a fright and appear to want the uſual ſupport from the air. The waters of the ocean alſo ſwell, altho no concuſſion of the earth or water can be perceived. Do not theſe phenomena indicate, either a want of the uſual weight or elaſticity of the air ? Or what defect is there in the maſs of air ſurrounding the earth, which is to be ſupplied by an exploſion of ſubterranean fire ? That there is a connection or dependence of the fire above on that beneath the earth, and that this ſubtle fluid acts and reacts between the earth and the air, with a rapidity and a force beyond all calculation, is to me extremely probable. The appearances that precede earthquakes indicate, that the fire which is to produce the ſhock, is in violent action, for a conſiderable time, before the ſhock. For ſeveral days before the earthquake at Oxford, Sept. 17, 1683, ignes fatui, luminous appearances, were frequently ſeen.

Baddam's Memoirs, vol. 2. 208.

It ſometimes happens that hot ſprings burſt forth before earthquakes ; and miners perceive heat in the earth.

Often have earthquakes been preceded by a perturbation, a ſtench, or diſcoloration of the water in wells and ſprings.

Sometimes the water in wells and rivers recedes or is evaporated before the exploſion. It is ſaid that Pherecydes once predicted an earthquake in Lacedemon, from the diſappearance of the water in a well.

Pliny, Nat. Hiſt. lib. 2. 79.

The rivers and ſmall ſtreams in Iceland are obſerved to become entirely dry for ſome weeks before an eruption of Heckla, as was the caſe in 1783. Meteors alſo, earthquakes and ſometimes flaſhes of lightning precede or accompany the eruptions.

See Van Troil's Letters on Iceland.

The various ſounds or noiſes which precede and attend earthquakes, are a ſtrong confirmation of theſe ideas. The uſual premonitory ſound is compared to the rattling of carriages on a pavement. Sometimes it is deſcribed, as the rumbling of diſtant thunder. But in truth the ſound is different at different diſtances, and reſembles no other ſound in nature. It is altogether ſui generis. It is moſt analogous, when near, to the rattling ſound from a near exploſion of the electrical fluid ; as thoſe can teſtify who have been near the place where lightning has fallen upon objects. It bears no reſemblance at all to any artificial ſounds, made by the exploſions of gun-powder, or other human contrivances. It is moſt unqueſtionably the effect of the electrical fluid, ruſhing from one part of our ſyſtem to another—probably from the earth to the atmoſphere, to reſtore the equilibrium, which has been, by ſome means, deſtroyed, or to anſwer other unknown purpoſes. This idea correſponds with the modern theory of earthquakes, which aſcribes them to the electrical fluid. See the Encyclopedia, art. earthquake. Let it be obſerved that at ſea, no ſound precedes an earthquake ; water being a good conductor of electricity.

Eruptions of volcanoes have alſo been preceded many weeks by a viſible fog or vapor, ſuſpended over the mountain, as happened before the great diſcharges of Heckla in 1783. To what cauſe ſhall we aſcribe this, but to the action of fire which precedes the exploſion ? And if a viſible vapor may be extricated by this action, for *months* before the exploſion, of which we have *certain* evidence, why may we not ſuppoſe, a ſmaller action or force to expel an inviſible vapor, in any place and at any time ?

Other facts authorize this conjecture. On the 12th of September 1784, the water of the Loch Tay in Scotland, ſuddenly receded 300 feet and left the channel dry ; then returned ; continuing this vibration for every ſeven minutes for two hours, and at the ſame hour in the day, for a week, with leſs violence.

No wind was ſtirring, and no viſible cauſe could be aſſigned for this novel phenomenon. To what cauſe ſhall we reſort for a ſolution, but to the inviſible energy of electrical fire?

Sinclair, vol. 6. 623.

If we admit then the action of electricity to be the cauſe of earthquakes, we ſhall have reached the general proximate cauſe of thoſe epidemic diſeaſes which ſpeedily ſucceed concuſſions of the earth. The cauſe muſt be the action of fire, the moſt energetic principle in nature. The manner in which this effect is produced, whether by forcing an unwholeſome vapor from the interior of the earth, and vitiating the atmoſphere; or whether by ſimply changing, on mechanical principles, the proportion of oxygen contained in atmoſpheric air, or by mere ſtimulus or other unknown means, is a queſtion of a curious nature, and worthy of philoſophic inveſtigation.

One thing is very evident, that what I denominate a *peſtilential principle*, does, at certain times, pervade not only the element of air, but the water alſo. The proofs of this are abundantly numerous and convincing. In all the great plagues which have afflicted the human race, other animals, as horſes, cattle, ſheep, ſometimes cats, dogs and fowls, together with the fiſh in rivers and the ocean, and even vegetables, have borne their ſhare in the calamity. The peſtilential principle has extended to every ſpecies of life. The beaſts of the field periſh with deadly epidemics; the fiſh die on the bottom of rivers and the ſea, or become lean and ſickly; while corn is blaſted on the moſt fertile plains, and the fruits in gardens and orchards, wither or fail to arrive at their uſual ſtate of perfection.

In the deſtructive plague which deſolated Italy in the time of Romulus, Plutarch and Zonaras mention a general ſterility of the earth; the very trees were affected, and all nature appeared to be defective in its powers of production.

In the beginning of the peſtilential period, in the reign of Juſtinian, Baronius ſtates that corn was deficient in quantity, and defective in its nouriſhing qualities.

About the year 1600, crops failed in all parts of Europe; as they did in both hemiſpheres, about the cloſe of the laſt century. Such was the caſe in 1740, in ſome parts of Europe; and in 1766. The failure of grain in India in 1770, and in 1783 and 1789, are ſtill remembered; and in ſome of theſe inſtances, the crops failed, at the ſame time, in China, India, Europe and America.

When exceſſive rains or dry ſeaſons precede this failure of crops, men are at no loſs to aſſign the cauſe; altho, in theſe caſes, they may ſometimes miſtake the true cauſe. But it often happens that grain fails of its uſual perfection, in ſeaſons apparently the moſt temperate and favorable. Obſerving farmers remark that, in certain years, when blaſt or mildew is expected from intemperate weather, grain proves to be good; at other times, the grain will ſhrink very much, under a ſeries of weather apparently the moſt propitious. This has been obſerved in Fairfield county, in Connecticut, where the excellent lands formerly produced great crops of wheat, with as much certainty as any other grain; but within a few years paſt, wheat has failed, without any apparent cauſe. In ſome caſes, the farmer ſcarcely receives his ſeed, altho the ſeaſons are favorable and no inſect appears.*

The failure of certain ſpecies of fruit-trees and ſhrubs is a fact equally remarkable.

Some kinds of apple, for a few years paſt, have been ſmall, knotty and ſprinkled over with ſpecks.

The plum-tree has become full of warts, or bulbous excreſcences, which kill the tree, and in ſome parts of our country, bid fair to extinguiſh the ſpecies. Theſe have been ſuſpected to proceed from a fly or ſmall worm; but on examination by a microſcope, I find reaſon to queſtion this fact. Some of the excreſcences contain a ſmall white worm, about a line in length; but they perforate the wood after the excreſcence is formed, as appears by their path; and ſome of theſe warts contain no inſect whatever. The inſect therefore finds a nidus in the excreſcence, but is rather an effect, than a cauſe. The burſting of the bark is a diſeaſe, which ſeems to have begun or been very much increaſed, during the preſent peſtilential period.

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* The ſame was the caſe in all the eaſtern ſtates for three or four years; but in this ſummer, 1799, the wheat has every where a full grain.

The peach-tree has, within a few years, been particularly ſubject to be deſtroyed by a worm, which attacks it juſt below the ſurface of the earth, and ſeparates the bark from the wood. If this is a common evil, ſtill the vaſt increaſe of it, at particular periods, is among the phenomena of peſtilence. The locuſt is periſhing by a ſimilar malady.

Cotemporary with theſe diſeaſes of the plum and the peach, has been a diſtemper of the pear, uſually called the pound pear, one of the moſt delicious of the ſpecies. For eight or ten years paſt, that fruit has been, univerſally in the part of the country to which my obſervations have extended, ſubject to a blaſt, from a ſpecies of ruſt which covers a large portion of its ſurface. In my own garden, not one in five is fit to eat; but I have ſeen one gentleman in a neighboring town, who thinks the pear is beginning to recover.

The univerſal death of the prim is a phenomenon ſtill more extraordinary, and a moſt ſevere calamity. The town of Eaſt-Hampton on Long-Iſland, loſt, in two or three years, two hundred miles of hedge—a greater loſs, ſays Mr. L. Hommidieu, in a paper publiſhed among the tranſactions of the New-York Agricultural Society, than if every houſe in the town had been burnt to the ground; as no proper ſubſtitute for fences has yet been diſcovered. The Engliſh black thorn has been tried, but has failed, owing to a fly that perforates the bark.

See part 2. 103.

The cauſe of the death of the prim is not known, nor the preciſe time when it began. But in Connecticut the failure was obſerved about twenty-five years ago; between the years 1770 and 1777, during the prevalence of the terrible angina and dyſentery among men. It contiuned gradually to extend for ſome years, and the prim has at laſt totally diſappeared.

It is remarkable that theſe diſeaſes among corn, fruit-trees and ſhrubs have generally, if not always, appeared firſt on the Atlantic ſhore, and gradually extended themſelves into the interior country. This is an obſervation made by many men in different parts of Connecticut. May we not from this circumſtance, deduce an argument, that the *infection is imported!!!*

But theſe phenomena are not *new* in the world ; they are new only to people who do not read. Aveienna, the Arabian phyſician, an author of great celebrity, ſays, that " the ſtate of air, called corrupt, either impedes the growth of plants or covers them with ruſt." Diemerbroeck, de peſte, p. 40. 41, enumerates, among the effects of a peſtilential air, the corruption of grain and fruits, the production of mice and noxious inſects which corrode and devour the corn ; the ſterility of the earth, which fails to yield the uſual quantity of grain and fruits. He takes notice alſo of another fact, which is, the unuſual diſpoſition to putrefaction in all kinds of fiſh, fleſh and vegetables, during peſtilence. This putrefaction, is, by the moderns, conſidered as a fruitful ſource of diſeaſes. In ſome caſes it may be ſo ; but it is always an *effect* of the ſame cauſe which produces epidemics.

Another remarkable fact to prove the univerſality of the peſtilential principle, is the ſickneſs and death of fiſh in rivers and the ſea. Several examples are recorded in ancient hiſtory. See the years 590, 994, 1240 and others. The number however of ſuch facts is not great, in the old books ; and whenever this phenomenon occurred, it was aſcribed to froſt, to a battle among the fiſh, or other improbable cauſe.

In modern times we have many examples recorded, but probably many others have eſcaped obſervation ; or been conſidered as things of no moment to mankind ; for within a century paſt, the opinion that the plague is propagated, in northern climates, by contagion only, ſeems to have ſuſpended all rational enquiries into the cauſe of the diſorder.

That the fiſh on the Britiſh coaſt or in the rivers, periſhed, during the laſt great plague in 1665, I find no where related, in a manner to render the fact certain ; but I find Hodge has mentioned a fact of that ſort as a proof that peſtilence is occaſioned by an unwholeſome vapor from the earth.

The death of the haddock on the coaſt of Norway in 1789, has been already mentioned, but as there were many ſhocks of earthquake in Scotland, about that period, it is not impoſſible that the haddock might have been ſuddenly killed by ſome concuſſion of the water. A ſimilar event took place on the American coaſt, in the great earthquake of November 1755, when ſome whales and multitudes of cod were killed, and ſeen afterwards floating on the water. I throw all ſuch caſes out of the queſtion, and confine myſelf to the ſickneſs and death of fiſh, when there has been no concuſſion of the waters, to occaſion a violent death.

The diſappearance of the blue-fiſh from Nantucket, in 1764, juſt after the great mortality among the Indians, is a remarkable fact. Not leſs ſingular was the ſickneſs and extinction of the Wellfleet oyſters in 1775, the year of a fatal dyſentery in America. Still more remarkable was the ſickneſs or ill-ſtate of the cod-fiſh taken on the banks of Newfoundland in the year 1788. They were thin, unfit for uſe and when preſerved, turned to a blue or dark color.

Ariſtotle remarked that no one peſtilential diſeaſe appears to affect all kinds of fiſh; but that theſe animals are ſubject to ſickneſs, which is known by their being thin, and not changing their colors.

De Hiſt. Animal. lib. 8. ca. 20.

But to come ſtill nearer to the preſent time. In the years 1793 and 4, the oyſters on the coaſt of Connecticut and Rhode-Iſland, were all ſickly, watery, and taſteleſs; wholly unfit for food, and in ſome inſtances, brought on nauſea or ſickneſs in thoſe who ate of them. This was the very time when the ſcarlatina was ſpreading over the country, with malignant dyſentery and typhus.

The ſhad which came to the New-York market in the ſpring of 1796, which was the period of peſtilence in New-York, were leaner than uſual, and periſhed, in defiance of the powers of ſalt.

In 1797, multitudes of ſmall dead fiſh floated down James river in Virginia. It is remarkable that in the ſummer following, all the country from Norfolk to Philadelphia, the very latitudes through which that river paſſes, was very ſickly; Norfolk, Baltimore and Philadelphia were all afflicted with the bilious plague.

I have been informed, that many dead ſhad were ſeen to float down the Suſquehanna, in June 1798; but of the fact, I have not ſatisfactory evidence.

The reader cannot fail to remark here, the correſpondence in place between the epidemic diſeaſes in the water and the air ; the fiſh and the human race, in *contiguous* regions, being diſeaſed about the *ſame time*—a fact too remarkable to be permitted to eſcape particular obſervation.

The mortal peſtilence among cats, in Europe and America, in 1797, is a fact too well known to be repeated. The ſickly ſtate of the water in the wells of New-Haven, during the peſtilential period of 1795 ; was evidenced by the number of animalculæ it contained.

Paracelſus mentions the death of fiſh but aſcribes it to the influence of the planets.

Vol. 1. 167.

Sorbait relates that in the time of the plague at Vienna, I ſuppoſe in 1679, a fountain in the ſuburbs, which had been eſteemed for the ſalubrity of its waters, exhaled a ſtench which appeared to increaſe the mortality in the vicinity. Van Swieten Vol. 16. 47. It is probable that Sorbait has miſtaken the effect of this ſtench ; it is probable the great mortality in the vicinity and the impurity of the water proceeded both from one ſource, an uncommmon effuſion of ſubterranean vapor in that particular quarter, or other unknown cauſe.

All theſe phenomena denote a peſtilential cauſe in water as well as air. Whether that cauſe is a poſitive ſubſtance infuſed into the elements from ſubterranean regions, increaſing the due proportion of oxygen ; whether it is a negative ſtate of the elements, occaſioned by the abſtraction of oxygen ; or whether it is occaſioned ſimply by a chemical alteration in the elements, by the mechanical operation of the electric fluid, which may produce new properties in air and water, by means of new combinations of their parts, are queſtions not eaſily ſolved. But without attempting to penetrate into the myſteries of nature, and unfold primary cauſes, we may be certain of their effects, and from this branch of knowledge, may deduce uſeful concluſions.

We know, for we ſee, the effects of ſome mortal principle, which, at particular periods, deſtroys or impairs the uſual powers of life, through the animal and vegetable kingdoms. We rationally conclude that this cauſe muſt be general, affecting the elements of life, over whole regions of the earth, and beneath the waters of the ocean. Of ſo much we are certain. As to the primary or remote cauſes, we ſhall probably remain in the dark—and as to the proximate cauſes, we can only indulge a rational ſpirit of philoſophical enquiry, that may lead to probabilities.

Sydenham is among the moſt reſpectable authorities for the doctrin of a change in the properties of air from a ſubterraneous vapor. His words are, vol. 1. p. 8. Wallis's Edit. "There are various general conſtitutions of years, that owe their origin neither to heat, cold, dryneſs nor moiſture ; but depend rather on a certain ſecret and inexplicable alteration in the bowels of the earth, whence the air becomes impregnated with ſuch kinds of effluvia, as ſubject the human body to particular diſtempers, ſo long as that kind of conſtitution prevails, which after a certain courſe of years, declines and gives way to another."

The reader will recollect that when the plague firſt broke out in Athens, the people alledged that their enemies had poiſoned the wells. In the mortal plague of 1349, the Germans ſuſpected the Jews had poiſoned the wells, and vented their rage upon the harmleſs Iſraelites. Theſe ſuſpicions doubtleſs aroſe from the bad quality of the waters, ſimilar to what was obſerved in New-Haven in 1795 : And the ſuſpicion of poiſon was full as well founded, as the modern doctrin of importation, in moſt caſes of peſtilence.

The death of fiſh in rivers and the ocean, is one of the ſtrongeſt arguments to prove the cauſe of peſtilence to be a ſubtle vapor, expelled or exhaled from ſubterranean regions. That fiſh do in fact die of epidemic diſeaſes, is a fact as well authenticated and as certain, as that epidemic diſeaſes affect the human race—and it is equally certain that ſuch mortality among the fiſh, is uſually cotemporary with peſtilence among men, on the adjacent ſhores. From theſe facts, we are powerfully inclined to believe, the general cauſe which affects the one ſpecies of animals, to be the ſame which affects the other ſpecies. This concluſion is eaſy, natural and irreſiſtible.

What then can be the principle which penetrates the waters, and reaches the animal functions of fiſh and oyſters on the bottom of the ſea ? Can it be a vitiated ſtate of the ſuperincumbent atmoſphere? Can a deleterious principle, belonging to the air, find its way through a maſs of water, and deſtroy life, as effectually as in its natural fluid, on the ſurface of the earth? Theſe are queſtions, I pretend not to ſolve. But I cannot help thinking that the only efficient cauſe, within our narrow comprehenſion, capable of extending the principle of deſtruction through the different elements, is the all-pervading energy of fire or electricity. The modus operandi is among the impenetrable arcana of the phyſical world.

It may not be uſeleſs to introduce here an obſervation made by elderly people in America, that in ſickly years, the aurora borealis does not appear. It is certain that during the preſent peſtilential period, ſince 1790, that phenomenon has never been obſerved, at leaſt not in any diſtinguiſhed degree of brightneſs.

But the hiſtory of the aurora borealis does not warrant the juſtneſs of this obſervation, as a general fact. The years 1564 and 5, which were diſtinguiſhed by northern lights, were ſickly in Europe, and in many parts raged the plague. The ſame lights were very ſplendid in November 1575, a year when the plague was ſpreading over Europe with unuſual violence and mortality. The ſame were repeatedly obſerved in 1580, the year of a moſt ſevere univerſal catarrh, when the plague raged in Paris, and when Cairo loſt 500,000 people by the ſame diſeaſe. Theſe lights were again viſible in 1621, and deſcribed by Gaſſendus in France, who it is ſaid gave them the name of *aurora borealis*. That year was noted for a moſt fatal epidemic ſmall-pox and the Hungarian fever in Europe; and the plague which raged among the Indians in America in 1618, had not ceaſed in 1621.

From this time to the year 1707, we have no account of the appearance of theſe lights. In that year, they appeared, but not of a remarkable brightneſs. If theſe lights appeared in this long interval, from 1621 to 1707, it is ſtrange that aſtronomers ſhould have left us no account of them. Certain it is, that the great Halley never ſaw this phenomenon till the year 1716, when he was 60 years old, and he began to deſpair of ever beholding it. During this long ſuſpenſion of the aurora borealis, epidemic peſtilential diſeaſes occurred very often in both hemiſpheres.

In the ſame interval, theſe lights were never ſeen in America; and our anceſtors, when they firſt beheld them, at the beginning of this century, ſuppoſed them a new phenomenon in creation; the memory of them having been loſt.

In 1719, in November, appeared theſe lights; which was at the commencement of a ſickly period of great ſeverity and extent—the plague was then raging in the Levant. A ſplendid phenomenon of the ſame kind was obſerved in Feb. 1720, the moſt unhealthy year of that period. The ſame in the three following years, and in 1725, 1726, 1728, 1730, repeatedly in 1733, a ſickly year, repeatedly in 1735 and 36, very ſickly years, when the mortal ſore throat prevailed—alſo in 1737.

From theſe facts, we conclude that the cauſe of peſtilential diſeaſes, has no connection with theſe viſible phenomena of the electrical fluid, as they are obſerved indifferently in healthy or ſickly years. It is evident however that the lumen boreale, is, in a certain degree, periodical.

Let us attend now to the effects of a peſtilential ſtate of air and water, in the production of inſects and ſmall animals. This is one of the moſt remarkable ſymptoms of a ſickly ſtate of the elements, and it is the more neceſſary to inſiſt on this phenomenon, becauſe it is viſible to every eye, and carries with it, during peſtilence, a demonſtration of the doctrines for which I contend.

In the threſhold of the hiſtory of plagues, we meet with accounts of myriads of noxious inſects, accompanying theſe calamities. The ten plagues of Egypt are numbered among the miraculous interpoſitions of providence, in favor of his choſen people. But ſo far as regards moſt of thoſe plagues, we find, by ſubſequent events, they are uſual occurrences during peſtilential periods. Such are ſwarms of inſects called in ſcripture flies and lice, and eſpecially locuſts, which, at this day and in every age, are generated, in unhealthy periods, in ſuch numbers as to darken the ſun, when on the wing, and which often devour every ſpecies of plants, and even the bark of trees. Theſe animals ſeem to have their origin in the deſarts of Arabia, bordering on Egypt and Syria; but they have often overſpread all Paleſtine, Judea and Italy—ſometimes they have penetrated into

Germany, Poland and Ruſſia. It is unneceſſary here to enumerate the inſtances related in the foregoing hiſtory, of the ravages of theſe animals; the reader has obſerved that inſtances of their appearance have often occurred in different periods, and that they are always the harbingers or the companions of the plague.

This fact leaves no room to queſtion, that the ſame ſtate of air in the oriental regions, which will generate epidemic diſeaſes, will often produce thoſe animals in unuſual numbers. They do not indeed always attend the plague; the particular ſeaſon moſt favorable to their generation is an exceſſively dry one; but it is obvious, that they rarely appear in deſolating ſwarms, except in periods when the neighboring countries are afflicted with mortal epidemics.

It is true that, in two or three inſtances, hiſtory informs us, dreadful plagues have originated from the putrefaction of theſe animals—the inſtance of the peſtilence on the African coaſt, about 126 years before the Chriſtian era, is memorable. But while this fact is not diſputed, we muſt obſerve that the ſame period was diſtinguiſhed for peſtilence in other countries, where no ſuch local or particular cauſe exiſted. Great ſwarms of locuſts therefore in the eaſtern countries, *may* be the cauſe of peſtilential diſeaſes, but always by accident; whereas they are certainly the forerunners or companions of that calamity.

See the years 394, 590, 677, 1031, 1084, 1091, 1186, 1234, 1337, 1476, 1646 and 7. Alſo before the Chriſtian era, the locuſts of the year 206 and 174.

In the deſtructive peſtilence which almoſt extinguiſhed the human race, in the reign of the Antonines, about the year 167, the earth was overrun with caterpillars.

During a moſt mortal period, about the year 590, an inundation deluged Rome, and ſuch multitudes of ſerpents were brought down the ſtream and lodged on the champaign country, as to occaſion a great ſtench and contribute to the ſubſequent mortality.

Worms and myriads of flies and other noxious animals are mentioned, in the foregoing hiſtory, as the attendants on peſtilence. See the years 763, 1001, 1106, 1234, 1286, 1348, 1390, 1575, 1598, 1610 and 12.

Lord Bacon informs us that during a plague in his time, there were found in the ditches and low grounds about London, a ſpecies of animals which he calls *toads*, with tails two or three inches long—a kind of animals doubtleſs which we often ſee in ſtagnant waters, but of larger ſize. He remarks further, that "thoſe years have been noted for peſtilential and unwholeſome, wherein there were great numbers of frogs, flies, locuſts, &c."

Works, vol. 3. p. 166.

Ariſtotle mentions the multitudes of frogs in ſickly years.

Prob. ſec. 1.

Horſtius informs us that unuſual numbers of frogs, toads, locuſts, ſerpents, canker-worms, mice, ſnails and ſimilar inſects, are the infallible ſigns of a peſtilence. To theſe he adds an extraordinary abundance of fiſh in the ſea and in rivers.

See p. 253, de peſte.

The commencement of the preſent peſtilential ſtate in America was diſtinguiſhed by an unuſual plenty of ſhad, of which fourteen thouſand were caught at one draft of a ſeine, near the harbor of New-York. I have met with one or two writers beſides Horſtius, who have mentioned this phenomenon, among the preſages of peſtilence, particularly Paracelſus in vol. 1. 168.

The plague of 1635 and 6 in Holland was accompanied or preceded by an incredible number of inſects, as gnats, butterflies, beetles, waſps, graſs-hoppers, but eſpecially flies, which were ſo numerous, as to cover the ceilings of houſes, and even to obſcure the ſun in the open air.

See Diemerbroeck, de peſte, p. 10.

In the plague at Lauſanne, in 1613, flies were in ſimilar abundance.

Ibm.

The approach of the plague at Dantzick, in 1709, was announced by incredible numbers of ſpiders, in the preceding year.

Baddam's Memoirs, vol. 6. 13.

The year 1633, which produced a peſtilential fever among the ſettlers at Plymouth in America, was remarkable for ſwarms of large flies, which filled the woods with their humming ſounds.

In the month of Auguſt, during a dreadful drouth at Bengal in 1770, which cut ſhort the rice-crops and produced a terrible famin, and ſubſequent epidemic fever, the air was filled with a cloud of inſects, of the ſize of a horſe-ſtinger, with a long red body and large head; they continued to obſcure the ſun for ſome days, during which all toads, frogs and inſects on the earth diſappeared, but this cloud in the air did not deſcend to the earth. The next year, a million of people periſhed with epidemic diſeaſes.

The preſent peſtilential period in America was introduced by ſuch multitudes of canker-worms and palmer-worms, as were never before known. Muſquetoes have been the harbingers and attendants on the diſeaſes in New-York and Philadelphia in 1793, 1795 and 1798. In this latter year, the whole country has been overſpread with graſs-hoppers, which very much injured the meadows, paſtures and gardens.

On theſe facts I will juſt remark, that they ſerve to confirm the hiſtorical truth of the ſcriptures. The whole ſeries of facts, relative to the great plagues that have afflicted mankind, is a tiſſue of proofs, that the hiſtory of the ten plagues of Egypt was written on the ſpot, and is a faithful record of facts. If the operations of nature are uniform, the ſcriptures cannot be a ſpurious production. They deſcribe Egypt and Syria, as to every thing reſpecting climate and productions, preciſely as they are at this day; and this fact is alone ſufficient to eſtabliſh their authenticity, againſt all the infidels on earth.

It may be impoſſible to define preciſely thoſe qualities of air and water which favor the production of unuſual multitudes of any particular ſort of inſects. It has been cuſtomary for writers to aſcribe them to *putrefaction* in the air; an indefinite and unintelligible term. It is true that muſquetoes and ſome other inſects are generated in hot, moiſt, ſtagnant air, and in marſhy places, when the putrefaction of vegetable and animal ſubſtances, is uncommonly rapid. But they are produced in pure water, alſo, without any apparent mixture of vegetable matter, beyond what is common to all water.

Flies, on the contrary, are moſt numerous in a hot and dry ſeaſon. Moiſture is hoſtile to their exiſtence; and in the year 1795, when the rainy ſeaſon commenced about the 20th of July, preceding the fever in New-York, the flies almoſt wholly diſappeared, and were ſucceeded by muſquetoes. Putrid ſubſtances are the food of flies, but the ſeaſons moſt favorable to putrefaction, do not always produce flies in the greateſt numbers.

In ſhort, it is not poſſible to account for the myriads of inſects which appear in particular years, on any known principles of the animal economy, or any viſible properties of air and water. If unuſual numbers of a particular inſect appear periodically, as in caſe of the canker-worms, tho I have not ſatisfactory evidence of the regularity of *their* appearance, in uniform periods, we ſhould naturally conclude ſuch animals to paſs through other forms of exiſtence, and to re-appear in a particular noxious form, at the end of definite intervals of time. But were this the fact, it would ſtill remain a problem of a moſt embarraſſing difficulty, to diſcover the reaſon of their appearance in unhealthy periods only. For ſuch is the fact, with moſt of the inſects, and their tranſmigration, if admitted, will not in the leaſt help us to account for their exiſtence, in thoſe times only when the ſtate of the air is unfriendly to human life.

But in truth, as to moſt of the noxious inſects which mark periods of epidemic diſeaſes, we know them not to change their forms of exiſtence, nor are the times of their appearance, periodical. On the other hand, we obſerve they appear in ſickly periods; and in unuſual numbers, at no other time. We conclude therefore that a ſtate of the elements, unfriendly to the health of man, is favorable to the generation of noxious inſects, but without attempting to explain the particular properties of the elements, which poſſeſs that prolific power.* All I contend for, by theſe facts, is, that the peſtilential principle, whatever may be its nature or properties is a *general* principle, affecting all the elements of life, and that to this general cauſe are we to aſcribe the deleterious diſeaſes which, at times, ſpread over extenſive regions of the earth. Under this juſt and philoſophical view of the ſubject, infection ſinks to a very trifling conſideration, among the cauſes of epidemic diſtempers.

The order in which inſects and diſeaſes appear, is not uniform; but it uſually happens that the inſects are the firſt in order of time. This was the fact in 1770, when the flies clouded the heavens in

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* May it not be the effect of excitement, owing to unuſual electrical ſtimulus?

Bengal, and the worms darkened the earth in America. Such was the fact in 1791 when canker-worms in June gave to our orchards the aſpect of winter. But the whole progreſs of epidemics is more or leſs marked by noxious and troubleſome inſects.

In 1798 and 1799, the meadows in ſome parts of Connecticut have been almoſt covered with ſmall toads, of the ſize of a cheſnut, and as deſcribed by Fernelius, "coloris cineritii," of the color of aſhes. Theſe animals, in ſuch numbers, are unuſual—they are not of the color of the common toad, and never grow to the ſame ſize. They come ſuddenly and in a few weeks diſappear! Who knows their origin or their end? Fernelius numbered them, more than two centuries ago, among the preſages of peſtilence, and we are witneſſes to the truth of his obſervation.

If we attend to the ſtate of a peſtilential air, in reſpect to its effects on inanimate objects, we are furniſhed with further proofs, that epidemic diſeaſes are the production, not of fomites from the ſick, but of a general deleterious principle.

A remarkable inſtance of the corrupt or defective ſtate of air, happened in the mortal plague of the year 252. See the deſcription of it under that year. It covered objects with what the hiſtorian calls "ros tabidus," a putrid corrupt dew or mould. A ſtate of air ſo extremely imperfect muſt have been utterly inſufficient to ſupport healthy life, in the animal ſyſtem.

The air of New-York in 1795 produced aſtoniſhing effects in the generation of mould, and the rapidity in the proceſs of putrefaction, in fleſh and vegetables, was almoſt incredible.

The fatal angina maligna among cattle in 1682 was attended with a blue miſt or dew on the herbage of paſtures. See the deſcription of it under that year.

It is not an unfrequent thing that a viſible and offenſive miſt or fog ariſes in places, during the rage of peſtilential diſeaſes. Such a miſt aroſe and ſpread over Dantzick, in Auguſt 1709, during the plague. This fog was ſo thick as to darken the air, for ſome time, and had a very offenſive ſmell.

Baddam's Mem. vol. 6. 14.

Schreibner, cited by Van Swieten, Vol. 16. mentions that a ſmall cloud often hangs over the infected place. It is ſuggeſted by that able author, that the contagion, collected into ſuch a cloud, may be diſperſed by winds, and afterwards collect at a different place. It is however more probable, that ſuch collections of impure vapor, are produced where they exiſt; and that, if once diſperſed, the particles are not afterwards collected. The phenomenon however is no inconſiderable evidence, that a peſtilential ſtate of the atmoſphere, is cauſed or increaſed by vapors exhaled from the bowels of the earth.

In the mortal peſtilence at Rome A. U. C. 576, Livy mentions a bow extended over the temple of Saturn, three mock-ſuns, and in the evening following, many tranſient meteors.

Lib. 41. 21.

A ſimilar fog or vapor during eaſterly winds, appeared in New-York, in September 1798, in the moſt fatal period of the plague. Perſons who felt and ſaw it, deſcribe it as moſt diſagreeable to the ſenſes; and its effects were very remarkable. The pavements of the ſtreets and other objects were covered with a coat of dew or mould, not however exactly reſembling either of thoſe ſubſtances; not unlike perhaps the "ros tabidus," or "ros ſanei ſimilis," of the year 252. Its effects were equally wonderful on the leaves of trees, which were covered with ſpots, which appeared as if corroded by an acid. And I have ſeen a cotton garment, which had been waſhed, and hung out on the night of the fog, which was alſo covered with ſpots of a dark, grey color, and which could not be taken out by any proceſs of waſhing. During this period alſo, iron railings and pump-handles were ſuddenly covered over with ſcales of ruſt, or a ferruginous color. Theſe phenomena correſpond with the effects of the peſtilential air at Oczakow in 1739, in which ſurgical inſtruments became livid or black, as did the ſilver hilt of a ſword.

Theſe recent facts which have come under my own obſervation, have enabled me to give due credit to hiſtorians, who mention ſpots in garments, appearing ſuddenly, during the plague. The writers who mention this phenomenon were moſtly monks or other eccleſiaſtics, whoſe relations are highly tinged with ſuperſtition; and as their imaginations have uſually wrought up theſe appearances into the figure of a croſs, or other chimerical ſorm, and aſcribed to them ſome miraculous qualities, I had paſſed over the paſſages with very ſlight conſideration.

I have however tranſcribed or rather abridged one of theſe accounts, under the head of plagues in the reign of Juſtinian. It is from Warnefred, who relates that in the peſtilence at Liguria, the Genoeſe territory, there appeared ſuddenly "quædam ſignacula," certain ſigns or ſpots, on doors of houſes, garments and utenſils which could not be waſhed out, but grew brighter by waſhing. See the account in the foregoing hiſtory, under the deſcription of the plagues between 542 and 600. I recollect reading ſeveral other accounts of ſimilar phenomena, which, for the reaſons juſt aſſigned, I neglected to tranſcribe when the authors were before me, which I now regret.

The celebrated Boyle mentions ſimilar phenomena during peſtilence, and particularly an inſtance in Naples in the year 1660, which happened after an eruption of Veſuvius, and which he aſcribes to a vapor. The vapor, he remarks, made impreſſions of curious figures on garments; and he cites Thuanus and Kircher, as authorities for his opinion. See vol. 5. p. 60.

In the dreadful plague of 746, ſimilar figures appeared on the garments of people, which the writer calls cruciculæ, little croſſes, which ſeemed as if drawn in oil. Theſe marks excited no ſmall terror, wherever they appeared.

Paulus Diaconus, Aug. Hiſtory, p. 1012.

Similar figures were impreſſed on the bodies of the men who were employed by Julian to rebuild Jeruſalem in 362 or 3, and who were driven from their work by earthquakes and eruptions of fire. From theſe facts we may be led to aſcribe the formation of ſuch ſpots to ſome electrical proceſs, or combination with an acid.

Theſe phenomena indicate a peculiar ſtate of the air, which is not common even during peſtilence. It is a ſtate which marks the higheſt degree of derangement in its ordinary healthful qualities, and ſuch, as bleſſed be God, does not often occur.

Another ſtrong proof of the doctrin here maintained of a peſtilential principle in the elements, is the well known fact, that during the plague, fowls abandon the atmoſphere of the infected places.

Livy mentions that in the terrible plague in Rome, anno urbis conditæ 571, not a vulture was to be ſeen for two years.

Dr. Gottwald remarks that in the Dantzick plague of 1709, ſparrows, daws, ſtorks and ſwallows deſerted the place for four months. Dr. Schelwig has recorded a ſimilar fact; and Sorbait affirms that birds deſerted Vienna during the plague. Thoſe kept in cages died.

Diemerbroeck has informed us that in the Holland plague of 1635 and 6 birds were unuſually rare. He remarks that birds more readily perceive the poiſonous ſtate of the air, and change their reſidence to places more ſalubrious, even abandoning their neſts and their young. The ſame fact has been obſerved by many medical and hiſtorical writers.

The ancient phyſician and compiler of medical ſcience, Ætius, mentions, among the ſigns of approaching peſtilence, the death of birds and quadrupeds. If, ſays he, the circumambient air is the cauſe of the diſeaſe, it will firſt ſhow its effects in deſtroying birds; if vitious exhalations from the earth, are the cauſe, quadrupeds will be firſt affected.

The fact goes to demonſtrate that the peſtilential principle pervades the aerial fluid and is offenſive to the delicate organs of fowls. It may be further mentioned, that the deleterious principle is often fatal to ſmall birds in cages, before it is perceived by the human race. It is a curious and well authenticated fact, that in the progreſs of a plague, in cities, ſmall birds ſicken and die; and not long after, the people in the ſame houſe, are ſeized with the peſtilence. Diemerbroeck was frequently an eye-witneſs to the fact, and he obſerved, that wherever the ſmall birds died in cages, the plague never failed, ſometime after and often in two or three days, to attack the inhabitants of the dwelling. This is another proof amounting to demonſtration, that the peſtilential principle is a quality of the atmoſphere, and that it is *progreſſive in its malignity*, having little or no dependence on the powers of contagion.

See Diem. de peſte, p. 11.

After all, the cauſe of violent and deſtructive epidemic diſeaſes may remain a ſecret. We ſee the cauſes of the ordinary diſeaſes of the ſeaſons, in marſhes, ſtagnant waters, confined air, and the like; but it often happens that peſtilence commits moſt cruel ravages, in ſeaſons apparently the moſt temperate, and in places evidently the moſt ſalubrious.

The plague in 542, and in ſubſequent periods of the fifty years plague of Evagrius, aſcended to the tops of the hills and mountains. The terrible plague of 252, in the reign of Gallus and Voluſian, invaded every village and almoſt every houſe. The deadly plague of 1348 penetrated likewiſe to the moſt healthy ſpots on the globe and even to the regions of Greenland, ſweeping away the human race, with undiſtinguiſhing ſeverity.

Hildanus informs us that in the plague of Lauſanne, in 1613, the huts of the peaſants on the hills and mountains were not exempt from the malady, tho detached and having no intercourſe with the infected. The ſame fact is recorded of the plague in 1720, which extended to the villages and mountains of Provence.

In the Traitè de la peſte, p. 29, it is aſſerted that in the melancholy plague at Lyons in 1628, the filthieſt houſes, the crouded places, narrow ſtreets and confined apartments, were places of the moſt ſafety ; while the moſt airy ſituations, as houſes on hills, were moſt expoſed to the ravages of the diſorder. No place was exempt—the change of air was uſeleſs or pernicious ; in ſome caſes, thoſe who enjoyed health in the impure air of the city, on removing into the country, were attacked with the malady. Malouin declares that the moſt populous and dirty places in Lyons and Marſeilles were leaſt affected with the plague.

Theſe facts are very ſingular ; yet it is not difficult to account for them, on the principle of a ſuperabundance of oxygen, ſtimulus, or principle of life in the atmoſphere. If, as is ſuppoſed, a uſual cauſe of peſtilential diſorders, is a too great quantity of oxygen in the air, producing firſt the ſtenic or inflammatory diatheſis, and of courſe indirect debility, then thoſe places muſt be moſt healthy, in ſuch a general ſtate of the air, where there is the ſmalleſt proportion of oxygen. This remark however is a mere conjecture ; and the facts related of the plague in Lyons ſtand as an exception to a very general rule, that the moſt filthy, unventilated places ſuffer moſt ſeverely by all kinds of peſtilential maladies.*

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* In Lyons, tanners and curriers eſcaped the plague, as did thoſe

It is alſo true in general, that the poor, who inhabit narrow ſtreets and alleys, amidſt filthy ſubſtances, ſuffer more by malignant complaints than the rich, who live in wider ſtreets, and more airy, cleanly houſes. To this however hiſtory preſents us ſome exceptions; caſes have occurred in which the rich have been the principal ſufferers, as in 1361.

While it may be difficult to aſſign preciſe reaſons for ſuch differences in the operation of the principle of deſtruction, the facts prove that this principle conſiſts in ſome hidden qualities of the elements, and does not ariſe from any of the ordinary viſible cauſes of diſeaſe. Riverius is explicit on this point. He avers that peſtilential diſeaſes often occur, without any apparent change in the viſible qualities of the air, and when the air *appears* to be more pure than at other times, when no ſuch diſeaſes prevail. Lib. 17.

Further, altho it is generally true that peſtilence is attended and greatly augmented in violence by ſome peculiarity in the ſeaſons, as exceſſive heat and moiſture or drouth, yet to this there are frequent exceptions. The reader may turn back to an inſtance of this, recorded by Livy and other Latin hiſtorians, in which it was remarked as a matter of ſurpriſe, that a violent plague, and one of the moſt deſtructive kind, ſhould aſſail the city of Rome, in a mild, temperate ſeaſon. A ſimilar obſervation was made reſpecting the plague in Paris in 1580. The ſummer was temperate and the fruits good. No viſible cauſe could be aſſigned for the malady. Yet a moſt certain, or rather an infallible ſymptom of a deranged ſtate of the elements, had occurred in that year; I mean a moſt ſevere univerſal influenza. Hence it appears, that altho peculiar ſeaſons may prodigiouſly increaſe, and perhaps produce a peſtilence; yet the general cauſe is often ſome principle which has no dependence on ſeaſon or changes of weather. In the laſt London plague, in 1665, ſays Hodge, the ſeaſon was mild, the heat moderate, and fruits abundant and good.

who cleanſed ſewers and privies. The ſame has generally been the caſe with the ſextons, and others employed in burying the dead. See Lanciſius page 160. In London, ſhipwrights who labored in the vapor of tar and pitch, eſcaped.

We have, in America, proofs of the truth of this doctrin The laſt peſtilential period commenced with the meaſles in 1789 and ſevere epidemic influenza in 1789 and 90 ; and has already continued ten years. Some of the ſummers, during this period, have been very temperate, as thoſe of 1794 and 1797. Yet every ſummer has produced the peſtilential fever of our climate ; and even our winters have exhibited ſymptoms of the diſeaſes which prevail in ſummer. Not one year, even the moſt temperate, of the whole period, has failed to ſhow the predominant diatheſis of the peſtilenee. The ſultry dry ſummers of 1793 and 98, and the ſultry humid ſummer of 1795, have rendered the diſeaſes more violent and fatal in the northern ſtates.

Yet in the more favorable ſeaſons of 1794, 96 and 97, the morbid cauſe produced its effects in New-Haven, Providence, Newburyport and Boſton, as well as in Baltimore, Norfolk and Charleſton.

Hence we obſerve that the elemental cauſe of the diſeaſes of this period, may be, in ſome degree, modified, but not controlled or ſubdued by the moſt temperate and favorable ſeaſons.

Indeed all writers of reputation on this ſubject agree, in this one opinion, that the plague cannot be aſcribed, either to intemperate ſeaſons, or to putrefaction, or to any ſpecies of exhalations from animal and vegetable ſubſtances. Theſe are allowed to be ſecondary cauſes, operating to modify or vary the operation of the primary cauſe ; but one uniform ſeries of obſervations from the beginning of hiſtory to this day, has driven medical writers from the defenceleſs ground of intemperate weather, and putrid exhalations.

Hippocrates learnt that peſtilence could not be aſcribed ſolely to viſible cauſes ; he therefore admits *to theion*, ſomething divine, or beyond human inveſtigation, to be a primary cauſe of this calamity.

Tacitus informs us that the plague in the time of Nero could not be aſcribed to any viſible intemperature in the ſeaſons.

Fernelius obſerves that altho immoderate heat augments the plague and every acute diſeaſe, yet he had known an exceſſively hot ſeaſon, paſs off without producing peſtilential diſeaſes. He agrees with Diemerbroeck, that the cauſe muſt be ſome unknown principle, "inquinamentum e cœlo demiſſum," ſome cauſe of corruption in the atmoſphere, which is infuſed into it from the celeſtial regions. This is cutting the gordian knot. Theſe authors are doubtleſs right, in rejecting the viſible qualities of the air, exhalations and intemperate ſeaſons, as the primary cauſes of the plague; but they fly from earth into the boundleſs regions of ſpace, for a cauſe which is more probably beneath their feet, or around their bodies.

Sennertus decides alſo moſt poſitively againſt putridity or corruption of the humors, as the cauſe of peſtilence; and maintains that it proceeds from an occult malignity in the air.

Skenkius contends that perſons do not receive the plague from humors in the body, from extraordinary ſeaſons, from inteſtine putridity, or corruption of indigeſted ſubſtances, nor from bad food or drink, nor from ſtagnant waters, nor from exhalations from dead bodies, cemeteries or ſewers, or the fetid waters of tan-yards; unleſs they inhale the noxious or infecting cauſe, e ſublimi. To produce the malady, requires no corruption of the manifeſt qualities of the air.

Page 764.

Proſper Alpinus, who lived ſome time in Egypt and had an opportunity to make perſonal obſervations on the diſeaſes of that country, maintains that the plague rarely ariſes from corrupt air, and never, unleſs when the Nile has exceeded its uſual limits in its inundations. If, ſays this writer, the diſeaſe proceeded from noxious exhalations from putrid ſtagnant waters and marſhes, it would occur every year, which is contrary to fact. Hence he concludes the diſeaſe to be uſually imported into Egypt from Greece, Syria and Barbary. In this opinion, he has been followed by a whole tribe of unobſerving travellers; who ſtupidly forget that by tracing the diſtemper from Egypt to Syria or Barbary, they never come nearer to its ſource. The queſtion ſtill occurs, what is its cauſe? where is its ſource? If putrid exhalations in Egypt will not produce the plague, will ſuch exhalations in Syria or Barbary produce it? Why trace it to theſe countries? Does any cauſe exiſt in Syria, Greece or Barbary to generate that diſeaſe, which does not exiſt in Egypt?

To avoid this dilemma, ſome writers inſiſt that its ſource is in Conſtantinople, where the ſeeds of it are treaſured up in old clothes, and preſerved from year to year, and from age to age. But why ſuppoſe this ſource of the diſeaſe to exiſt in Conſtantinople only ? Why not the ſame ſource forever exiſt in Egypt, for there alſo infected clothes are never purified. In ſhort, from Proſper Alpinus to Mead and Cullen, all the reaſonings and aſſertions of authors on the origin of the plague, argue either impotence of mind, want of obſervation or extreme prejudice.

So far as this, Alpinus is right, that exhalations alone from ſtagnant waters and marſhes will not ordinarily generate the plague; but aided by ſome general primary cauſe in the elements, ſuch exhalations do produce the plague, and in no country more frequently than in Egypt.

Gibbon alleges this diſeaſe to proceed from hot, damp, ſtagnant air, drawing this concluſion probably from the origination of the terrible plague of 542, in the foul regions near Peluſium in Egypt, and in the vicinity of a large marſh. But if this were the only cauſe neceſſary to produce the diſorder, as Alpinus juſtly obſerves, it would occur regularly every year, for every hot ſeaſon generates putrid exhalations in ample abundance, and in every hot climate, will be found annual returns of hot, damp, ſtagnant air, The cauſes therefore aſſigned by Gibbon are inadequate to the effect.

In America, beyond almoſt any other country, we have the moſt irreſiſtible arguments againſt this opinion. No country on earth, not excepting the rice plantations on the river Bengal, preſents ſuch an immenſe region of ſtagnant waters, and fetid marſhes, as the eaſtern ſhore of the United States, from the Delaware to Florida. The ſouthern extremity of this region is in a climate always warm ; and the whole of it is expoſed to burning heat, for four months in the year. Yet the true, " peſtis inguinaria," of the oriental countries has never appeared in this country, as an epidemic ; and the ſpecies of the plague which occurs, and which I call *bilious* or *American*, appears as rarely amidſt the marſhes of Carolina, as in the northern cities, which are expopoſed to no marſh exhalations.

Now if hot, damp, ſtagnant air, and putrid exhalations alone were adequate to the production of this bilious plague, it muſt be produed every year, in a multitude of places on the American coaſt ; whereas in fact, that diſeaſe rarely occurs, as an epidemic, even on the flat lands of Carolina and Georgia ; and never is very extenſively mortal, except when the northern ſtates, which are ſituated on high, rocky, gravelly and dry lands, and whoſe air and water are of the moſt pure and ſalubrious kind, are afflicted alſo with malignant epidemic diſtempers.

This is a remarkable fact and one on which I will venture to reſt the whole argument. In no inſtance, has the city of Charleſton, ſituated on an immenſe flat, ſurrounded by the marſhes of Aſhley and Cooper rivers, been ſeverely troubled with a contagious bilious epidemic, except when the ſeaſons have been ſickly in the northern ſtates. Witneſs the years 1699, 1728, 1732, 1739, 1745, 1748, 1796. I ſpeak not of ſporadic caſes among ſtrangers that viſit the ſouthern ſtates, for theſe may occur every year.

The Europeans might, had they not been blinded by the falſe notions of contagion, long ago have diſcovered the ſame important truth ; for what is called a great plague in Egypt or Syria, never occurs, except during the prevalence of malignant epidemics all over Europe, even to the Baltic. Lighter epidemics occur in Egypt and Conſtantinople, in any uncommon ſeaſon ; and ſo does the ordinary autumnal bilious fever, in all our ſouthern ſtates. Theſe are diſorders which may be excited, in any place and any ſeaſon, by the action of heat on vegetable ſubſtances in ſtagnant water, or by the local impurities which always exiſt in populous cities. But theſe ordinary diſeaſes do not put on the malignant ſpmptoms which characterize the diſtempers of peſtilential periods—they do not exhibit infection. On the other hand, when the diſeaſes of Egypt aſſume contagious and deadly ſymptoms and ſpread deſolation over that country, we ſhall always find the northern parts of Europe, more or leſs afflicted with the ſame or other malignant diſorders. The peſtilential principle, in greater or leſs degrees of violence, extends over the whole European world, and not unfrequently over the American continent.

Thus, altho the plague does not, in modern times, appear in the north of Europe, at leaſt not often, yet all the great plagues in the Levant are viſible, if I may indulge the expreſſion, in the augmented bills of mortality in London, Amſterdam, and the Baltic cities. Witneſs the peſtilential periods of 1720, of 1736 to 1740, of 1760 to 1763. Even the leſs violent peſtilences of 1772 and 3, and of 1784 to 1786, have been marked by epidemics in England and Scotland. And, in the laſt ſeries of epidemics, the years 1792, 93 and 95, which have been diſtinguiſhed for the plague in the eaſt, as well as anginas and plague in America, exhibit a conſiderable increaſe of mortality in London.

All theſe facts ſerve as evidence of the truth of what the medical writers of the fifteenth, ſixteenth and ſeventeenth centuries have unanimouſly advanced, that the primary cauſe of peſtilence is ſome inviſible quality in the elements, altogether diſtinct from corrupt air, or marſh exhalations.

It is a remark of the Arabian phyſicians, that an indiſpoſition of the air is neceſſary, in the hotteſt climates, to enforce the action of putrid effluvia on the human body to produce the plague.

Mead, 248.

Dr. Mead himſelf, while he maintains that the putrefaction of animal ſubſtances, with unſeaſonable moiſtures, heats and want of winds, produces the plague, and while he contends that no kind of putrefaction in European countries, is ever heightened to a degree capable of producing the true plague, admits that a corrupted ſtate of air is neceſſary to give the contagious atoms their full force, otherwiſe the plague could never ceaſe, but with the extinction of mankind. That is, he holds the plague never to appear in European northern countries, without contagion, but that the contagion would remain inert, without a corrupt ſtate of the atmoſphere.

The abſurd opinion, that northern climates will not generate the ſtate of air which occaſions a peſtilence, but that a peſtilential germ, or leaven, muſt be imported from Egypt or other ſouthern latitude, has been adopted by moſt of the Britiſh medical writers, and by a numerous part of the phyſicians in the

United States. It is hard to ſay whether the followers of Mead are the more ſervile, or their opinion, the more unphiloſophical. But for my preſent purpoſe, it is ſufficient that even the advocates for the propagation of the plague by a ſpecific contagion, admit that this cauſe is not adequate to the effect, and that they are compelled to ſummon to their aid a general principle of corruption in the air, to account for its propagation in northern climates. This conceſſion of the exiſtence of ſuch a principle, by whatever name it may be called, is all I aſk.

It is on this principle only, we can reconcile the differing accounts of authors, in regard to the effect of putrefying bodies after battles, in producing peſtilential diſeaſes ; ſome alleging that ſuch corrupting bodies will produce the plague, and others denying the fact. Julius Alexandrinus, Diodorus Siculus and other authors, relate that plagues have ariſen from the putrefaction of dead bodies after battles. Three or four inſtances occur in the foregoing hiſtory, of plagues aſcribed to the putrefaction of dead locuſts. Foreſtus relates that a dead whale, caſt upon the ſhore of Holland, occaſioned an extenſive peſtilence in Egmont. See Hieronymus, Aguſtinus, Sabellicus, Walſius, Angelus, Paræus, and Agricola, who have recorded ſimilar facts, as cited by Diemerbroeck de peſte.

Dr. Gottwald relates that the plague which ſpread over the north of Europe from 1702 to 1711, originated near Pickzow, ſoon after the unfortunate battle between the Saxons and Swedes ; but he ſays nothing of putrefying bodies, nor does he aſcribe the diſeaſe to that cauſe.

Baddam's Mem. 6. 5.

At the ſame time, it it equally true, that thouſands of dead bodies after battles have periſhed unburied, without producing any ſuch effect. In 1642, eight thouſand dead ſoldiers and innumerable carcaſes of horſes, after a battle in the Duchy of Juliers, were left to putrefy on the ſurface of the earth, cauſing an intolerable ſtench, but producing no peſtilential diſeaſe. The ſame fact happened often, ſays Diemerbroeck, p. 31, in the cruel wars, between the Swedes and Imperialiſts, in his days ; and we know that other hiſtorians have related ſimilar facts.

Whenever a malignant diſeaſe follows ſuch an extenſive putrefaction, Diemerbroeck alleges, the diſeaſe to be only a peſtilential fever, but not the true plague. Or if, in any inſtance, the true plague follows, he maintains the putrefaction to be only a ſecondary cauſe. This is probably a near approach to the truth. The whole myſtery is unfolded, on my principles, which teach the exiſtence of a diſordered or peſtilential ſtate of the elements, at particular times. If the putrefaction of dead bodies takes place during theſe periods, when the animal functions are debilitated, or impaired, and the human body, prone to diſeaſe, the corruption of fleſh may ſo far vitiate the atmoſphere as to produce peſtilence. But if thouſands of dead bodies putrefy on the earth, when the air is in its natural ſtate, ſalubrious and adapted to the ſupport of health, and when the human body is in full vigor to reſiſt the effects of the foul effluvia, it is hardly poſſible for any quantity of diſſolving fleſh to evolve a poiſon, adequate to the production of peſtilential diſorders, and certainly not ſufficient to occaſion an extenſive epidemic.

An attention to this diſtinction will alſo reconcile all the differences of opinion, and all the contradictory phenomena which regard the effects of vegetable effluvia, and the impure air of cities.

Why, it has been triumphantly aſked by the advocates of imported fomites, did not the filthy ſtreets and putrefying vegetables of New-York and Philadelphia, produce the bilious peſtilence, in former years? For many years, we recollect, more foul ſtreets and docks, much greater accumulations of filth, yet theſe produced not the contagious fever which has lately deſolated our cities.

Such are the facts, I admit; and the ſame will again take place, when the period of peſtilence ſhall be cloſed, and the latent diſorders of the elements, corrected. But there has exiſted, ſince 1789, a univerſal defect in the healthful powers of the elements, clearly evidenced by a ſeries of ſevere epidemics, the influenza and ſcarlatina, the increaſed violence of the ſymptoms of ordinary diſtempers; by the imperfection of fruits; by the ſickneſs and death of fiſh, fowls and cats, with many diſorders among other animals. The moment this ſtate of the elements occurs, the local impurities which always exiſt in cities, and which produce only ordinary diſeaſes, in a healthful diſpoſition of the elements, give to thoſe diſeaſes new virulence and a contagious quality. The whole ſecret to be unfolded, is, that the autumnal diſeaſes, under the debilitating operation of a general derangement of the elements, acquire unuſually ſevere ſymptoms, a wider extenſion, and the quality of contagion or what I call infection. Theſe phenomena excite the aſtoniſhment of men, who have not attended to the hiſtory of peſtilence, in which they might have found the means of ſolving the difficulty ; for ſimilar facts have marked the progreſs of peſtilential diſeaſes, from the days of Moſes to this hour.

I would further obſerve that from univerſal obſervation, it appears, that during that ſtate of air, which produces contagious diſeaſes in unuſual numbers, all kinds of fleſh and vegetables are more apt to putrefy, than in a healthy ſtate of the atmoſphere. This was obſerved by Diemerbroeck in the Holland plague of 1636 ; and we have had many proofs of it in America, within a few years paſt. And this is evidently true not only of freſh animal meat, but alſo of ſalted meats of all kinds. The powers of ſalt appear to be inſufficient to preſerve fleſh and fiſh, againſt the ſtrong tendency to diſſolution, which ſeems to attend them in certain years. Hence we ſo frequently hear of ſpoiled beef and pork, and fiſh during ſickly periods.

In ſome ſeaſons, it appears to be almoſt impoſſible to keep proviſions, deſtined for a foreign market. This effect on fleſh and fiſh may proceed either from unuſual heat and moiſture in the air, or from an obvious imperfection or ſickly ſtate of the animals ; and perhaps, independent of theſe cauſes, it may proceed ſometimes from the ſame inviſible principle in the properties of air, which originates new and malignant ſymptoms of diſeaſe in the human body ; a mere exceſs of ſtimulus.

But whatever may be the cauſe, the effect is obvious ; and the unexpected putrefaction of ſalted meats, has often been among the cauſes which have generated or augmented peſtilential diſtempers in America. Such an inſtance is mentioned at New-Haven in 1794, where a quantity of putrid fiſh was thrown into the dock, and was exceſſively offenſive, juſt before the appearance of the peſtilential fever. In New-York, the laſt ſummer, the peſtilence evidently received great force and malignancy from large quantities of beef and pork which ſpoiled in ſtores and cellars. A ſimilar cauſe is ſuppoſed to have excited or increaſed the ſame diſeaſe in Boſton and New-London. The putrefaction of remains of great multitudes of the fiſh called Menhaden, on the wharves in Newburyport, in 1796, was obviouſly a powerful exciting cauſe of the diſorder in that town.

In ſuch caſes, putrefaction is more rapid, and its ſtench more poiſonous, than under a healthful conſtitution of the atmoſphere. This accelerated diſſolution of fleſh is the *effect* of the common principle of diſeaſe, and in its turn, becomes the *cauſe* of diſeaſe.

Hence we may obſerve, that it is only during a ſickly ſtate of the elements, that putrefaction is ever known to excite peſtilential epidemics; for almoſt every man has obſerved, many times, that the ſame quantities of putrefying fleſh, in periods of health, produce no ſuch diſtempers. It is this circumſtance which has puzzled all ſuperficial obſervers, and furniſhed the advocates of imported infection, with ſtrong ground to maintain their errors. They allege, "the ſame cauſes have not always produced the ſame effects.' As putrefaction and filth have not, at other times and always, produced diſeaſes in our climate, therefore they do not produce the peſtilential fever of the preſent time, and it *muſt* be occaſioned by imported fomites." Theſe men have not attended to ſimilar facts in all other countries and in all ages. The ſame argument would prove that no peſtilential diſeaſe can be generated any where; for it is as true of the Weſt-Indies, of Egypt and Conſtantinople, as it is of the United States, that putrefaction does not, every year and at all times, produce peſtilence. In this fact agree all authors who have written on the cauſes of the plague. And there is reaſon to believe, with Diemerbroeck, that putrefaction *alone* never produces the plague; but that whenever it is the *apparent exciting* cauſe, there concurs with it a general ſickly ſtate of the air; which not being viſible, mankind aſcribe the whole effect to putrefaction.

In the United States, it is a very curious fact, that this ſickly ſtate of the elements has been progreſſive, as I have particularly proved, in the preceding pages, which progreſſion was clearly marked by the increaſe of mortality by the ſcarlatina, and other diſeaſes of unuſual malignity. In every inſtance, the epidemic peſtilential fever, tho ſaid to ariſe from putrid fleſh, has kept pace with this inſalubrious ſtate of air. For example, while Philadelphia was ravaged by the plague in 1793, the ſcarlatina was prevalent in New-York; but the eaſtern ſtates were exempt, and felt no inconvenience from the peſtilential ſtate of the air, unleſs in a few ſporadic caſes of autumnal fever, of augmented violence, which indicated a *commencement* of the epidemic conſtitution. In 1794, this conſtitution arrived to its *criſis* in Connecticut, moving eaſtward in its progreſs; and at New-Haven appeared the peſtilential fever, ſoon after its precurſor, the ſcarlatina. Now whether we ſuppoſe the peſtilence to be from imported fomes, or from the putrid fiſh and clams in the docks, it is remarkable that it did not occur till the ſtate of air was evidently ſickly, and ill-fitted to ſupport life, as appeared by the malignant dyſentery in the vicinity, and by the univerſal prevalence of ſcarlatina. This is a curious and important fact.

Proceeding eaſtward we obſerve the ſame truth. The peſtilential fever at Newburyport was ſaid to be excited by the putrid garbage of fiſh—true, but this effect did not take place in 1793, when the fever was laying waſte Philadelphia; nor in 1795, when the ſame fever prevailed in New-York. Why? evidently becauſe the conſtitution of air in the eaſtern ſtates, had not then arrived to its criſis of malignancy. But moving eaſtward, the ſcarlatina began to ſhow itſelf there in 1795, and in 1796 was more general and fatal in all the adjacent country. Then followed the peſtilential fever, both in Boſton and Newburyport. So that if we admit the diſeaſe to be of imported origin, or ſuppoſe it to ariſe from putrid exhalations, we are ſtill compelled to admit the concurrence of ſome general cauſe in the production of the diſeaſe, becauſe we never know this peſtilence to appear, but when other diſeaſes and phenomena demonſtrate the exiſtence of ſuch a cauſe.* In Philadelphia, in New-Haven, and in almoſt every place, the peſtilential fever has followed cloſe upon the heels of that malignant diſtemper, the ſcarlet fever.

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* If it ſhould be ſaid, that putrid fiſh might not have exiſted, in other years, in ſituations to expoſe the inhabitants: I anſwer, that with-

With reſpect to the duration of this general conſtitution of air, we can determin nothing, but by the event. We obſerve in hiſtory, that ſuch peſtilential periods are of various length, from three to fifteen years, or perhaps for a longer time; during which, diſeaſes are multiplied and augmented; and all bearing ſome peculiar ſymptoms, that characterize that conſtitution or ſtate of the elements. On this ſubject the treatiſe of Sydenham is invaluable.

There remains one other view of this ſubject to be conſidered in this ſection—this is, the connection of peſtilential diſeaſes with famin.

Moſt authors have remarked that famin is a cauſe of peſtilence, and have cited the old Greek adage, *o loimos meta limon*, peſtis poſt famem, the plague follows famin.

It is a juſt remark that the true plague often follows a dearth of proviſions; it is more frequently true, that ſcarcity is followed by diſeaſes of a leſs malignant type. But it is equally true that this order is often inverted, and famin follows peſtilence. It is more frequently true that peſtilence is neither preceded nor followed by any ſcarcity of proviſions. Inſtances of all theſe facts appear in the preceding hiſtory. The concluſion is inevitable, that the plague proceeds from ſome other cauſe, than a deficient or ſuperabundant quantity of food, for it often occurs, independent of either of theſe circumſtances.

Thus Morellus, de feb. peſt. lib. 3, relates an inſtance, where no peſtilential diſeaſes ſucceeded a ſevere famin. Galen mentions an inſtance of a ſevere famin which followed as ſevere a plague in Rome, yet the famin did not again excite the plague.

De Pauw, in his Philoſophical Diſſertations on the Egyptians and Chineſe, vol. 1. 87, anſwers and refutes the Abbe Fourmont who alleged famin to be the cauſe of the plague.

" By exact annotations, ſays De Pauw, continued during

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in my obſervation, in numberleſs inſtances, immenſe quantities of the entrails of fiſh are left to putrefy on the ſhores of our rivers, every year, with an intolerable ſtench, but without producing the leaſt appearance of diſeaſe.

twenty-eight years, we find the plague has raged in Egypt ſive times, without being preceded by any ſcarcity of food, and contrary to what I once ſuſpected, unreſtricted to a periodical courſe." We know alſo in America, that ſcarcity of food can have had no influence in producing the numerous epidemic and peſtilential diſorders of the laſt nine years.

On this ſubject Diemerbroeck has a very juſt remark, and one that ſolves all the difficulties that might ſeem to ariſe from the differing accounts of the effects of famin. He ſays "Non omnem, ſed illam tantum famem ſequitur peſtis, quæ fames et ipſa a peſtilentiæ cauſa originem ſumit, (dum ab ea cauſa primo fruges terræ corrumpuntur, poſtea peſtis inducitur,) ita ut fames illa non ſit cauſa peſtis, ſed ipſamet eandem cum peſte cauſam habeat."

De peſte, page 30.

"For the plague does not follow every famin; but that only which ariſes from the ſame cauſe as the plague; (for by that cauſe the fruits of the earth are firſt vitiated and afterwards the plague ſucceeds) ſo that the famin is not the *cauſe* of the plague, but proceeds itſelf from the ſame cauſe."

Whenever there exiſts a general cauſe in the elements, unfriendly to the health of the human race, and at the ſame time, to the growth and perfection of grain, peſtilence and famin may be companions of each other; or they may reciprocally follow each other, according as the general cauſe operates firſt on vegetables or on mankind. In ſuch caſes, ſuperficial obſervers are apt to ſuppoſe one to be the cauſe of the other, when in fact, they are both the offspring of a common cauſe.

In long ſieges, bad food is often a powerful cauſe of diſeaſe, as in the ſiege of Marſeilles by Julius Ceſar, before Chriſt 48. Ceſar, De bel. civ. lib. 2. 20. In ſuch caſes, the bad qualities of the corn or bread, are not natural defects in the growth, but the effects of age, heat, moiſture and decay.

Fortunately, the improved ſtate of agriculture has rendered a dearth of grain, a rare occurrence. In deſpotic governments, where induſtry of every kind languiſhes, and men ſeldom make proviſion for ſubſiſtence beyond the paſſing moment, famin is not unfrequent in modern times, as in Syria after the terribly ſevere winter of 1756-7, when the crops failed, and parents devoured their children, or offered them for ſale in market to procure food. But ſuch is the ſtate of agriculture, in free countries, that crops are leſs liable to fail, than formerly; and when they fall ſhort in a particular country, commerce may uſually ſupply the deficiency from ſome other climate. A univerſal failure of grain, even under the moſt unfavorable diſpoſition of the elements, muſt be a rare phenomenon.

Yet with all our improvements in agriculture and commerce, we are not to calculate with certainty that we are never to feel the ſcourge of famin. There has been, within about a century, a ſucceſſion of ſeaſons when the earth failed to yield her accuſtomed quantity of vegetable food. Such were the laſt years of the laſt century, when corn was cut ſhort by mildew and blaſt, not in one country only, but in moſt countries. Multitudes periſhed in the north of Europe, and our forefathers in America obſerved, that for a number of years, the very courſe of nature ſeemed to be altered.

The beginning of the ſeventeenth century was diſtinguiſhed by a ſtill more extenſive and ſevere dearth, which afflicted all Europe, and cut off a large portion of its inhabitants.

In the year 1783, the dearth in Scotland was ſo ſevere that commerce alone ſaved thouſands from periſhing; and ſo late as the year 1790, our own country experienced a ſcarcity that excited univerſal alarm. Both of theſe periods were diſtinguiſhed for ſevere famin in Egypt, Bengal and the Carnatic.

Such facts ſhow us the all-powerful influence of the inviſible energies of nature, and how little avail human efforts, to avoid the fatal conſequences of a univerſal failure in their operation. That the principles of vegetation do thus fail, at certain times, over large portions of the globe, is an unqueſtionable truth; it is equally certain, that ſuch events are intimately connected with the cauſe of peſtilence among men. Hence we obſerve that men and cattle often periſh with epidemic diſeaſes, when vegetables fail to yield their cuſtomary fruits.

It is not however the *want* of food which occaſions diſeaſes, ſo frequently as the bad quality of it. Next to the corrupt ſtate of air, ſays Riverius, unwholeſome aliments are the cauſes of peſtilent diſeaſes. Vegetables may acquire unwholeſome qualities from too much or too little moiſture, or from other unknown cauſes. Grain of a good quality may alſo degenerate and become unwholeſome, by heat and moiſture, after it is gathered, as in magazines, granaries, or holds of ſhips. Such corn may produce diſeaſes in thoſe who feed upon it.

But it is doubtful whether mere want of food ever produced a contagious diſeaſe. Seamen who ſuffer and even periſh at ſea, in a wholeſome air, thro mere hunger, pine away and die without diſeaſe. Whenever contagious diſtempers accompany dearth, there is uſually a concurrence of other cauſes to produce the effect.

We may therefore conſider the propoſition of Diemerbroeck as correct, that famin does not produce the plague, but proceeds from the ſame cauſe; yet that ſcarcity of food and ſtill more certainly, food of a bad quality, may produce diſeaſes of a leſs malignant type, or very much augment, in violence and extent, the current diſorders of a particular ſeaſon.

Yet here again our ſenſes may deceive us. Corn of an apparently bad quality, does not always generate diſeaſe. A ſtriking inſtance of this is related in Sinclair's Scotland, vol. 7. 605. Froſt, rain and ſnow had turned the corn black; it was diſagreeable to the taſte; the ſtraw was equally affected; but neither man nor beaſt ſuffered by feeding on them—ſo little do we know of the cauſe of diſeaſes.

Intimately connected with the ſubject of vegetable nutriment, is the conſideration of diſeaſes among cattle. Whenever graſs is defective in wholeſome, nutritious qualities, horſes, horn-cattle and ſheep are ſure to ſuffer by mortal diſtempers.

It is often mentioned in the foregoing pages, and a fact that every man may have obſerved, that when contagious diſeaſes prevail among men, ſimilar diſorders prevail more or leſs among cattle. Very few of the plagues in ancient Rome, affected one ſpecies of animals, without ſhowing the peſtilential principle in others. The ſame remark may be made, in all ages, and is true at the preſent period. Sometimes the peſtilence invades one ſpecies of animals firſt—ſometimes another; ſometimes the diſeaſes will be more general and ſevere among men, and ſometimes among cattle; but ſeldom do we obſerve one ſpecies of animals ſeverely affected, and the other totally exempt.

So far as my reading and obſervations enable me to judge, diſeaſes among cattle uſually ſucceed exceſſive or unſeaſonable humidity in the air. The years 1712 and 13, when a plague deſtroyed a vaſt proportion of the cattle in Italy, and great numbers in Germany, are noted in England, to have been wet and cold. What was the ſtate of the air in the countries where the diſeaſe was moſt fatal, I am not informed. The ſhort account I have ſeen of it, abridged from Ramazzini, in the 6th volume of Baddam's Memoirs, makes no mention of the weather or ſeaſons; and Lanciſius, who has alſo left many particulars reſpecting it, is not before me. The diſeaſe however was a true plague, characterized with many of the ſymptoms of plague in the human body. Authors all agree that the diſtemper was propagated ſolely by contagion from a ſingle cow, from Dalmatia; and they are ſo well contented with this idea, that they tell us little or nothing from which we can collect the cauſe. Like the writers on the cauſe of the plague in Egypt, who trace it to Barbary or Syria, and there leave the ſubject; ſo Lanciſius and Ramazzini, tell us the diſtemper, which deſtroyed moſt of the cattle in Italy, came from one cow, in a drove from Dalmatia; and there they ſtop ſhort, without a ſyllable to explain why the cow from Dalmatia was ſeized.

All theſe contagion-ſticklers reſemble the Indian, who, when aſked what the world ſtands on, replied, on an elephant—the elephant, on a great turtle, and the turtle, on the ocean. Here he ſtopped, and as to what ſupports the ocean, he leaves us in the dark.

The general viſible cauſe of peſtilential diſeaſes among cattle, as before remarked, ſeems to be an exceſs of moiſture, which renders their food watery and unſubſtantial. The ſummer of 1751, a year of remarkable mortality among the cattle in England, was cold and rainy. Such was the ſeaſon in 1348, which was followed by a great loſs of ſheep, as well as by peſtilence among men.

Yet all wet ſeaſons do not produce the ſame effect; and we are conſtrained to reſort, for the cauſe, to unſeen properties in the air or the food on which the cattle ſubſiſt.—That the ſame general cauſe affects cattle and the human race, in times of peſtilence, is obvious from the analogy of ſymptoms in their diſeaſes. During the preſent ſickly period in America, horſes and horned cattle have died, in many parts of the country, with diſeaſes which are characterized with bilious appearances; in analogy with all the diſorders which have affected men, during the ſame period.

Lanciſius and Ramazzini would have treated the ſubject of the diſeaſe among horſes and cattle in Italy, in 1712 and 13, much more like philoſophers and men of ſound ſcience, if, inſtead of telling how much miſchief an infected cow had done, and how the diſeaſe had been ſpread, by farriers, by dogs and by ſhepherds, they had deſcribed to us the ſeaſons, the ſtate of vegetation and the diſeaſes which prevailed among mankind. They ought at leaſt to have connected, with the diſeaſe among cattle, an extenſive plague among men which was then raging in Vienna, Hungary, and other countries, as it had been, for ſeveral years before, over all the Poliſh and Baltic territories.

The frequent prevalence of mortal epidemics among the brutes, is an obvious and irreſiſtible proof of ſome deleterious principle in the elements, which is adequate to the production of the worſt diſeaſes, and the deſtruction of life, independent of every artificial cauſe.

The brutes, if left to themſelves, follow implicitly, a principle of their nature, called inſtinct. They eat what nature intended for them, and never feed on what is pernicious to their health; nor will they injure themſelves by eating too much or too little of their ordinary food. Governed by ſuch a law, they can be liable to no diſeaſes, but ſuch as muſt neceſſarily proceed from the air they breathe, the water they drink, or the vegetables they eat, all of which are ordinarily good, nutritious, and well fitted to ſupport ſound health. Their diſeaſes therefore muſt proceed from ſome imperfection in theſe elements of life, which is occaſioned by natural cauſes. This proceſs of reaſoning appears to be ſtrictly logical and correct. The concluſions from it are inevitable. If a ſtate of the elements does ever exiſt, which can produce diſeaſes that deſtroy the lives of the brutes, without contagion or any artificial cauſe, we may ſafely allege that a ſtate of the elements may exiſt in any latitude which is adequate to the production of the moſt formidable maladies, that ever affect mankind.

The analogies of the animal economy, and continual obſervations forbid us to ſuppoſe the powers of life in the beaſts of the field, leſs perfect, or more eaſily diſſolved, than thoſe of the human race. On the contrary, from their following their natural undepraved appetites, in the uſe of food and in all their actions, their bodies may be ſuppoſed to be more firm and perfect than thoſe of men, who are uſually debilitated by irregularities in living, and other deviations from the laws of nature. If then irrational animals are ſubject to the invaſions of mortal epidemic diſeaſes, which mow them down by thouſands, in defiance of the firm texture of their bodies, and their regular living, a fortiori the human race muſt be liable to deſtruction by ſimilar means.

This reaſoning is certainly juſt and ſubſtantial, whatever may be its fate in convincing the reader ; and it proves that the natural operation of ſome ſecret principle in the elements, is ſufficient to account for the moſt deſtructive maladies, in every latitude on the globe, without reſorting to the tranſportation of fomites from ſome one heaven-ſcourged country to more favored regions.

Dr. Mead and all his ſervile admirers who believe him, without inveſtigating his aſſertions, allege that putrefaction never riſes, in England, to a degree that is neceſſary to generate a peſtilence. But if any man can believe that putrefaction, as writers are pleaſed to call the principle of deſtruction, can riſe high enough in the grades of malignity, to produce a plague or contagious mortal diſtemper among cattle in England, and at the ſame time, never affect the human ſpecies, he muſt have more pride in the ſupereminent ſtation of man in the ſcale of being, than I poſſeſs. The argument from facts is evidently in favor of the theory, which ſubjects all animals, in this reſpect, to the ſame laws ; and the analogies of creation will not authorize man to claim the high privilege of exemption from the general laws of the animal economy.—It is an unqueſtionable truth, that men as well as brutes, in all latitudes, are often invaded with contagious and deadly diſeaſes, under the operation of the elements, without the leaſt acceſſion of contagion from ſouthern climates or any foreign country. Multitudes of facts warrant this deduction; but the progreſſion in the violence of epidemic diſeaſes, the imperfection of vegetables, the ſickneſs and death of fiſh in rivers and the ocean, and of cattle on land, are proofs of the truth of my principle, which bid defiance to oppoſition.

SECTION XVI.

Of Contagion and Infection.

NO point on the ſubject of diſeaſes has been more agitated among medical writers, than that of the contagion of the plague, inguinal and bilious.

Hippocrates has left no deciſive opinion on this queſtion, but thoſe who maintain the plague not to be contagious, rely on this ſilence of the father of medicin, as an argument in their favor.

Galen's opinion was clearly in favor of the contagiouſneſs of certain diſeaſes. "Quodque periculoſa ſit converſatio cum laborantibus peſtilenti morboquum nimirum is non ſecus ſit contagioſus, quam ſcabies aut lippitudo."* p. 379. The author doubtleſs ſpeaks here of other peſtilent diſeaſes, beſides the inguinal plague, according to the practice of the ancients who gave the name of *peſtilence* to other malignant diſtempers, when epidemic. His opinion however was that the plague originates in a putridity of the air, inhaled by the breath. "Lues ipſa, ab aeris putredine exorta, per inſpirationes inſiliens, haud unum aut alterum hominem, ſed plures quoque civitates depaſcit, vaſtat, et populatur." p. 627. In another paſſage, he remarks, that peſtilent diſeaſes proceed from a ſtate of the atmoſphere. "Peſtilentes morbi a cœli ſtatu proficiſcantur."

This author obſerved that peſtilential epidemics muſt have ſome cauſe more powerful and extenſive, than contagion, or infection.

Ariſtotle was clearly of opinion that the plague is contagious, and the reaſon he aſſigns why peſtilence alone is communicated from perſon to perſon, is, that this is the only diſeaſe which is common to all men. This is not very clear or ſatisfactory ; but he ſpeaks of fomites proceeding from the ſick, and infecting others. See Problem, ſect. 1.

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* In another tranſlation, the latter part of this paſſage ſtands thus; "periculum enim eſt, ne concipiatur, ut ſcabies et lippitudo."

Procopius was not a phyſician, but is eſteemed as a hiſtorian. He alleges that in 543, the mortal plague in Conſtantinople was not contagious, and that phyſicians and attendants on the ſick, did not contract the diſeaſe.

On the other hand Thucydides, has declared unequivocally that the plague in Athens was very contagious. Evagrius alſo has related that the diſeaſe, in his time, was very contagious, to particular perſons, while others eſcaped, even againſt their inclination. Livy alſo was decidedly in favor of the doctrin of contagion.

Petrus Salius Diverſus, cited by Diemerbroeck, was of the opinion, that the plague is ſometimes contagious ; at other times, not. Seneca held to the contagious nature of peſtilence. So ſays Ovid, Metamorph. 7.

Quo proprior quiſque eſt, ſervitque fidelius ægro,
In partem lethi citius venit.

The nearer we approach, and the more faithfully we ſerve, the diſeaſed, the ſooner we fall victims to the diſtemper.

Thoſe who oppoſe the doctrin of contagion, not only produce as authority, the ſilence of Hippocrates, with Avicenna, and other Arabian phyſicians, on the ſubject ; but they allege, that if the plague was a contagious diſeaſe, it would *always* infect thoſe who have communication with the diſeaſed. But this they aver to be contrary to fact ; and they inſtance the eſcape of many phyſicians, ſurgeons, grave-diggers, hearſe-men, and others. They argue further, that as the breath and effluvia of perſons in health, will not expel the poiſon of the plague from the diſeaſed ; ſo, on the other hand, the effluvia from the infected, cannot infuſe the ſeeds of the diſorder into a healthy body.

Gregory Nyſſen, a celebrated philoſopher and theologian, concludes, that thoſe who are ſeized with the plague, after an intercourſe with the diſeaſed, contract it from the ſame ſtate of the air, which occaſioned the diſtemper in the ſick, and not from the effluvia exhaled from the infected body. While I cannot aſſent to this opinion, in the utmoſt latitude, I firmly believe it contains a great deal of truth.

Diemerbroeck, de peſte p. 44, ſuggeſts that the ancient phyſicians, who paſſed over the ſubject of the contagion of the plague, called that quality only *contagion*, which communicates diſeaſe by immediate contact, as in caſe of the itch, leproſy, hydrophobia and the like; whereas the plague infects more frequently through the medium of the air, vapors, garments and other objects. Thus the ſweat, exhalations, and excrementitious matter of the ſick corrupt the air, and this infected air becomes the means of diſeaſe to perſons in health who breathe it. This, ſays Diemerbroeck, the ancients did not call contagion, proceeding from the diſeaſed, but they conſidered healthy perſons taking the diſtemper through this medium, as infected by the malignity of the air.

Almoſt all modern phyſicians however agree in the opinion that the plague is a contagious diſeaſe, as Foreſtus, Proſper Alpinus, Diemerbroeck, Sydenham, and a multitude of others; and on this general opinion, have been inſtituted quarantine laws and other regulations for preſerving cities and countries from the diſeaſe. Of the value of theſe regulations, we ſhall be the better able to judge, after taking a careful ſurvey of the queſtion relative to the force and effects of contagion.

Within a few years, one author has ventured again to call in queſtion the received opinions on this ſubject. Dr. Maclean, in a ſmall treatiſe, has attempted to prove that the plague, dyſentery and epidemic fevers are never propagated by contagion. Contagion he defines to be " a ſpecific matter generated in a perſon affected with diſeaſe, and capable of communicating that particular diſeaſe, with or without contact, to another."

This author's general arguments are theſe, That ſpecific contagion muſt neceſſarily act and communicate a diſeaſe from a ſick to a well perſon, within a certain diſtance—that in the plague, dyſentery and epidemic fevers, a ſmall proportion of people, expoſed to the action of effluvia from the diſeaſed, are ever affected by the diſtempers, and therefore ſuch diſorders are not contagious. He conſiders thoſe diſeaſes only as contagious, which can be received but once by the ſame perſon ; as the ſmall-pox and meaſles. He affirms that the exiſtence of contagion in plague, dyſentery and fevers, has been uniformly taken for granted, not only without proof, but even contrary to the evidence of numerous and convincing facts. He lays it down as a truth, that all epidemic and peſtilential diſeaſes, which may affect a perſon more than once in his life, are cauſed by certain ſtates or viciſſitudes of the atmoſphere, producing indirect debility.

The variety of opinions on this ſubject argues either a want of accurate obſervations among medical men, or of accurate diſtinctions in terms. The various powers of diſeaſes to communicate themſelves, either have not been underſtood, or they have been imperfectly defined. Let us then attend to facts, the only genuin ſource of knowledge.

Firſt. We obſerve that the contagion of the meaſles and ſmall-pox, takes effect with great certainty, whenever a perſon in health, who has never been affected, approaches ſufficiently near to a diſeaſed perſon. I do not ſay it *always* takes effect ; for there are a few exceptions ; but theſe are ſo rare, as not to impeach the generality of the fact, or principle.

The contagion of the plague, dyſentery and violent fevers, does not, under circumſtances equally favorable, take effect with the like certainty. On the contrary, a great proportion of perſons expoſed to the effluvia of the ſick, entirely eſcape the diſtempers.

Secondly. The contagion of ſmall-pox and meaſles, is not ſenſibly affected in its operation by heat or cold, moiſture or drouth. It acts with the ſame certainty in winter as in ſummer, and in every variety of temperature.

The contagion of plague, dyſentery and typhus fevers, on the other hand, depends almoſt entirely on heat for its activity, and is ſubdued, rendered inert, or totally extinguiſhed by cold. Hence an eſſential difference in the two ſpecies of contagion—that of the ſmall-pox and meaſles being an eſſential quality of the diſeaſes ; while that of the other diſeaſes is an accidental circumſtance.

Thirdly. The contagion of the plague often diſcriminates between the natives of particular countries, or men of a particular blood, or family, ſeizing one and paſſing by another, and this through the whole courſe of an epidemic; but the ſmall-pox and meaſles make no ſuch diſtinctions.

Fourthly. The contagion of the ſmall-pox and meaſles is not deſtroyed by the purity of the atmoſphere; it acts with the ſame certainty on the moſt ſalubrious hills, as in the moſt impure receſſes of poverty.

Not ſo the contagion of the plague, and dyſentery; for as a general rule, theſe diſeaſes are not propagated in a pure atmoſphere. With reſpect to the plague, ſome exceptions exiſt; but it is the uſual fact, that theſe laſt named diſeaſes will not ſpread by contagion in a wholeſome ſtate of the air. By removing the ſick, from a city into the country, or otherways placing him in an airy room, and preſerving it clean, with all the apparel and utenſils, the contagion is ſo diſſipated or attenuated, as to be rendered harmleſs; the attendants eſcape, and the diſeaſe is extinguiſhed with the death or recovery of the patient.

Fifthly. The contagion of the ſmall-pox and meaſles can never act but once on the ſame perſon. Its firſt operation deſtroys the capacity of receiving it a ſecond time. The exceptions to this rule are too few to deſerve conſideration.

Totally different is the effect of the plague and dyſentery, for inſtead of fortifying the body againſt a ſecond attack, theſe diſeaſes debilitate the animal powers, and render the patient more ſuſceptible of the contagion in a ſubſequent year. It is admitted by all correct obſervers, that the plague may be received by the ſame perſon, times without limits; a perſon in Conſtantinople died of the twelfth attack; and many perſons, in the late plagues in America, have been affected two or three times. With reſpect to dyſentery and other contagious fevers, there is no controverſy on this point.

Sixthly. The contagion of the ſmall-pox and meaſles, if it takes the leaſt effect, produces the diſeaſe complete. The infected patient may be affected more lightly than the infecting perſon, and the degrees of violence in the ſymptoms may be very various; but the diſeaſe produced, will always be completely formed, and of the ſame ſpecific type, as that from which it is communicated.

The contagion of the plague and dyſentery, has not the ſame certainty in its effect. The contagion of the plague very often produces only a nauſea and vomiting—ſometimes an inferior grade of fever, as an intermitting or remitting fever, of which I have myſelf ſeen examples—very often its effects are limited to dizzineſs in the head, or ſevere pains in the glands—and ſometimes it has produced external eruptions, without any other material affection; as in the celebrated Diemerbroeck, who, in the grievous plague at Nimeguen, was affected with a carbuncle on his left hand, while in good health. In 1796, I ſaw an inſtance in New-York, in which the infection of the peſtilential fever had occaſioned a ſingular ſwelling and inflammation in the face of a nurſe, who eſcaped the diſeaſe.

Seventhly. We may perhaps add, what Diemerbroeck and other writers conſider as eſſential to give effect to the contagion of the plague, and dyſentery, an apt or ſuitable diſpoſition in the ſound body to receive the contagion. Some peculiar ſtate of a body in health is evidently neceſſary to the operation of the infecting principle of the plague; this is agreed by all authors. But it does not appear that any ſuch ſtate or diſpoſition is requiſite to give effect to the contagion of ſmall-pox or meaſles, which acts upon all bodies, within the reach of their effluvia. This conſideration may be the cauſe of the firſt diſtinction before recited; and a few exceptions exiſt to the propoſition in regard to the ſmall-pox and meaſles, which, tho rarely, fail of operating on bodies in health.

Theſe are important diſtinctions, which, had they been obſerved by medical writers, would have prevented the enormous errors of Mead and others, who maintain that the plague is propagated, in northern countries, by ſpecific contagion only. The truth is, the plague is a contagious diſeaſe, like dyſentery, and moſt typhus fevers, but the contagion is *not ſpecific.*

Specific contagion I define to be, a quality of a diſeaſe, which, within a ſuitable diſtance, communicates it from a body affected with it, to a ſound body, with great certainty, and under all circumſtances of ſeaſon, weather or ſituation. Such is the contagion of the ſmall-pox and meaſles. This contagion is of two kinds; firſt, that which acts by contact only, as that of the itch, leproſy, hydrophobia and ſiphilis; ſecondly, that which produces its effect, with equal certainty, by near approach, as that of ſmall-pox and meaſles. The contagion of the angina maligna approaches to the ſpecific kind; and if it is true, as ſome modern phyſicians have aſſerted, that perſons can never be affected with it, more than once, it comes under the character of a *ſpecific* contagion, but I doubt the fact. Several perſons in Bethlem, were affected with the ſcarlatina anginoſa twice, during the late epidemic; firſt in 1793 and again in 1794.

Medical Repoſitory, vol. I. 525.

That quality of a diſeaſe which may or may not excite it in a ſound body, within a ſuitable diſtance, or by contact; and which depends on heat, foul air, an apt diſpoſition in the receiving body, or other contingent circumſtances, and which may excite the diſeaſe in the ſame perſon more than once, is certainly a very diſtinct ſpecies of contagion, from that of the ſmall-pox, and to this I give the denomination of *infection.*

With a diſtinction of this ſort, which ſeems to have been firſt adopted by an eminent phyſician in New-York, Dr. Bailey, in his treatiſe on the fever of 1795 page 38, and which is unqueſtionably well founded, we have no difficulty in explaining all the phenomena of contagion, which have given riſe to diſputes, without number and to the moſt contradictory opinions. The plague, glandular and bilious, the dyſentery, typhus fevers, and the milder kinds of angina, are not *ſpecifically contagious*, but they are *infectious*. They will not and do not propagate themſelves in all ſituations, but the operation of the infecting quality is controlled by a multitude of contingent circumſtances.

Firſt. It is admitted on all hands, that a ſuitable and particular conſtitution of air, is neceſſary to render the plague epidemic in northern latitudes. Thus Sydenham ſuppoſes this diſeaſe to be conveyed by peſtilential particles from one place to another, but not to become epidemic, unleſs favored by the conſtitution of air. One ground of his opinion ſeems to have been a fact related by Mead, that when the diſeaſe has raged violently in one town, in the ſame climate, a neighboring town has totally eſcaped, by forbiding intercourſe with the infected place, as once happened in Tuſcany.—This fact will be afterwards conſidered.

Mead alſo, while he declares his opinion that the plague is ſpread by ſpecific contagion only, like ſmall-pox and meaſles, and that all plagues are to be traced to Egypt, very inconſiſtently admits that a certain corruption of the air is neceſſary to give the contagious atoms their full force.

Theſe opinions are utterly incongruous; for if the plague poſſeſſes ſpecific contagion, like the ſmall-pox, then a corrupt ſtate of air is *not* neceſſary to give full force to the contagion; for no ſuch ſtate of air is requiſite to give force to the contagion of the ſmall-pox. It ſpreads with as much certainty in pure air, as in foul air. Mead's principles therefore overthrow his own theory. But he was driven to admit ſome general conſtitution of air, to be neceſſary to the propagation of the plague, becauſe he had learnt from reading that the plague will not ſpread in all places, at all times and under all circumſtances. In truth, Mead never had an idea of the difference between the ſpecies of contagion; and the ſame may be ſaid of moſt modern writers.*

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* It is a moſt extraordinary circumſtance that the Britiſh authors, in modern days, ſhould all agree that a favorable conſtitution of air is neceſſary to propagate the plague, and yet that no plague is bred in northern climates. They muſt admit and do admit, that ſuch a favorable ſtate of air has often exiſted in all parts of Europe; this is a kind of half way buſineſs; allowing northern climates the power of creating and preparing a condition of atmoſphere that ſhall meet the plague half-way.

But will it be denied that the petechial fever and angina maligna originate in northern latitudes? I preſume not. Then the condition of air is admitted to produce *moſt deadly infectious* diſeaſes, but not *the moſt deadly of all.* Kind heaven, in mercy to the northern world, has permitted the elements to generate diſeaſes almoſt as bad as the plague, but not quite.

I then aſk, does not the production of the angina maligna ſuppoſe as deleterious a principle in the air, as that of the plague? Is not the diſeaſe as fatal to youth, and more certainly infectious or contagious? This cannot be denied. That diſeaſe ſometimes deſtroys as great a proportion of patients ſeized as the plague, and is more certainly contagious to youth? Beſides this diſtemper depends not on local cauſes, but wholly on a condition of the elements; it therefore implies a moſt eſſential alteration in the atmoſphere.

Sanctorious, cited by Van Swieten, remarked that the rays of the plague may be removed by the wind, yet he was ſurpriſed to obſerve that theſe rays from the body of a diſeaſed perſon, are never diſturbed by the force of the air. I do not perfectly reconcile theſe remarks ; but it is an indubitable fact, that a peſtilential ſtate of air, when clearly and diſtinctly formed in a city, is not diſſipated, nor very greatly affected by the moſt violent winds. It has ſometimes been remarked, that the peſtilential fever in American cities, has been ſpread by particular winds ; but it has ſpread not only before, but againſt the wind, tho perhaps with leſs rapidity. Certain it is, that no force of wind whatever ever expels from a town, or leſſens the peſtilential virus without the aid of other cauſes. Of this we have had repeated proofs in America.

Perhaps we may explain this fact, and reconcile the obſervations of Sanctorius, on the principle I have unfolded ; by ſuppoſing the effluvia of the ſick to be, in ſome degree, capable of diſſipation by the wind, which is undoubtedly true ; but that the elemental cauſe of peſtilence, which conſiſts in the eſſential properties of the atmoſphere, is not ſubject to diſperſion or removal by the winds. This conſideration would involve a curious queſtion, viz. whether, in the apparent motion of air, called wind, the whole maſs of the ſurrounding atmoſphere is moved, or whether it is the vapor, or other component parts of the air only, which are moved, while the fire or electric fluid remains ſtationary. But whatever may be the cauſe, the fact is certain, that the peſtilential principle, during a plague in a city or town, is never expelled by winds. A moſt violent, cool north-weſt wind ſwept the city of New-York, on the 19th and 20th of September 1795, without any conſiderable abatement of the peſtilential fever. This fact adds no ſmall weight to my opinion, that the primary cauſe

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Further, if petechial fever is generated in northern climates, it demonſtrates the power of thoſe climates to produce the plague ; for it has been proved, that this fever is the ſame ſpecies of diſeaſe, and oftens turns to the plague. It has done this, very often in England and on the Baltic.

Infection ſpreads certain diſeaſes, and ought to be avoided ; but medical men have aſcribed ten times more effects to that cauſe, than it ever produced. The ſame principle which generates the angina maligna or plague, in one inſtance, muſt be competent to produce it in all other perſons of like diſpoſition and habits.

of ſuch diſeaſes, is in the eſſential combination of the component parts of the atmoſphere.*

Sanctorius further obſerves that "things infected with the plague, communicate the diſeaſe, as long as the proximate and remote cauſes ſubſiſt; one of which ceaſing, the infection ceaſes." This is an explicit acknowledgment that the contagion is not *ſpecific*, but dependent on ſome other cauſe, agreeable to the doctrin of Sydenham.

This principle is verified moſt remarkably in Egypt, as appears by all the authors who have written on the ſubject. They are all conſtrained to admit, even when they allege the plague to be not native in that country, that, if imported at certain ſeaſons of the year, it will not ſpread. Proſper Alpinus expreſsly declares that the plague is *never imported in the months of June, July and Auguſt;* "nunquam viſa eſt peſtis illuc ex infectis locis profecta;" altho he maintains that the diſeaſe is almoſt always imported.

This is certainly a moſt extraordinary aſſertion, and unworthy of the reputation of the writer. What in the name of ſenſe and conſiſtency, ſhould prevent the ſeeds of ſuch a diſeaſe from being "imported" in a particular ſeaſon, when veſſels are paſſing continually between that country and infected places? The idea betrays extreme weakneſs or prejudice.

Savary in his letters on Egypt has detailed the true ſtate of facts. He ſaw veſſels, which arrived in Egypt from Turkey, in the month of Auguſt, and landed their infected goods and people, without communicating the diſeaſe. He informs us, that it is an obſervation of ages, that infected merchandize brot into Egypt, in the months of June, July and Auguſt, do not excite the plague, but the diſeaſe expires of itſelf. If introduced at other ſeaſons, and communicated, it ceaſes; but if imported in winter, it ſpreads.

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* Warm ſoutherly rains however high the wind, uſually increaſe the violence of the diſeaſe, by inducing debility and giving activity to the local cauſes, as noxious effluvia from vegetable ſubſtances. Cool northerly winds, *accompanied with heavy rains*, leſſen the morbid action of the peſtilential principle; and if late in the ſeaſon, and not ſucceeded by very warm weather, may entirely remove it. A violent tornado, with great rain, on the 8th of October 1797, was ſuppoſed to put a ſtop to the peſtilential fever in Providence. Water decompoſes the poiſon, or incorporates it into its own maſs—but *heat* after moiſture occaſions a more rapid decompoſition of vegetables and increaſes the poiſon,

The author has here ſtated effects or phenomena, with a good degree of accuracy; but has entirely miſtaken the cauſe. It is wholly the ſtate of air, in different ſeaſons, and not infection, which occaſions theſe varieties.

Mackenzie, in an account of the plague in Conſtantinople, tho a firm believer in its contagion, declares "that both in that city and in Smyrna, the plague breaks out in ſome years, when it is not poſſible to trace whence it is conveyed." This is doubtleſs true; yet neither this fact, nor the known fact that contagion in Egypt will not operate in a certain ſeaſon of the year, has ever opened the eyes of European authors to the abſurdity of the current notions about the ſpecific contagion of the diſeaſe.

A fact related by Patrick Ruſſel, in his hiſtory of the plague at Aleppo in 1760, is full to the ſame point, that the contagion of the plague, will not take effect, without the aid of other cauſes. In 1759, the diſeaſe was introduced into Leinſol, a port on the ſouth ſide of Cyprus, where it ſpread. Larnica, a town forty miles diſtant, received part of the infected crew, which brot the contagion to Leinſol. A conſtant communication was held between the two cities; peaſants and mule drivers entered Larnica, with their peſtilential ſores upon them, and were daily in the ſtreets and markets. Some died in the houſes of the inhabitants. Other veſſels alſo arrived with infected crews from Egypt, ſome of whom died on landing. Yet mark the iſſue—all this contagion did not excite the plague in Larnica! But in the beginning of the next year, eight months after, the diſeaſe appeared in Larnica, without contagion, and made great havoc. See Ruſſel, page 4.

This fact and others compelled the author to admit that the diſeaſe is not always contagious, and that it does not become epidemic, without a certain ſtate of air. See pages 4, 5, 7, 17, 19, 307. Theſe facts are of infinite conſequence in directing the application of laws of quarantine; a ſubject to be hereafter diſcuſſed.

Innumerable examples may be produced of plague, appearing in a few detached caſes, without becoming epidemic and without extending itſelf by contagion beyond a ſingle family. Often it appears in ſporadic caſes, without exhibiting any contagion.

Follinus relates an inſtance of a family, in which the father, mother, with two children and a ſervant died of the plague, without glandular ſwellings, and without ſpreading the diſeaſe beyond that family.

Joubert informs us of an inſtance in 1574, of a reſpectable family, which loſt half of its members, by the plague, which ceaſed without ſpreading the infection. This was at the commencement of a moſt peſtilential period.

Matthias Untzerus relates, that at Halle in Saxony, he was an eye-witneſs of inſtances, in which here and there a family had been ſeized with the plague, introduced from other places, without any ill effects in the reſt of the city—the diſeaſe terminating in theſe families.

Diemerbroeck obſerved ſimilar facts. In Oct. 1661, the daughter of a noble widow, was ſeized with a violent diſeaſe reſembling the plague, in the midſt of a town where no plague exiſted, and no foreign cauſe could be aſſigned for the diſeaſe. The ſervant, who attended her, died, and the infection extended to ſeven perſons, in ſucceſſion; the reſt ſaved themſelves by flight. Theſe perſons died, without the glandular tumors, and of courſe ſome of the attending phyſicians, denied the diſeaſe to be the plague. Diemerbroeck, on the contrary, judging from all the ſymptoms, pronounced it the plague. It happened that one of the maidſervants, who left the family and was going to her brother's at Amſterdam, was infected and ſeized with the plague, which ſoon put on the genuin marks of the diſeaſe, in an inguinal tumor and two anthraces. She recovered, but infected two of her brother's children, and there the diſeaſe diſappeared. No local cauſe could be aſſigned for the diſeaſe in that family. The plague was not before in the city or country, the houſe was a ſplendid, elegant one and kept remarkably clean, remote from any filthy place, and had never been known to have an infected perſon in it. Hence our author concludes very juſtly that a peſtilent diſeaſe is not always epidemic, nor is an epidemic always dangerous, nor is peſtilence neceſſarily common to many people; but that the ſpreading of a diſeaſe by contagion, is wholly an accidental circumſtance.

See p. 13, 14, of Diemerbroeck de peſte.

On this laſt fact, I will only obſerve, that the year it happened, was 1661, the beginning of the conſtitution which produced the augmented violence of the diſeaſes of London, as related by Sydenham, and the conſtitution which occaſioned the plague in Holland in 1663 and 4, and that in London in 1665.

It is to be regretted that thoſe able phyſicians and accurate obſervers had not extended their views of the ſubject to a prevalence of that peſtilential conſtitution, in various countries, at one and the ſame time, inſtead of reſtricting their obſervations, each to his own country.

The author of the Traité de la peſte, who was a warm ſtickler for the origin of the plague at Marſeilles in 1720 from importation, and wrote a treatiſe to prove it, has however demonſtrated the contrary. He has admitted that the air of Marſeilles was peſtilential and produced diſeaſes marked with buboes and carbuncles, in the autumn preceding its ſuppoſed importation. But this is not all; he has recorded facts which confirm all that has been cited from Alpinus, Savary, Ruſſel and others, that the contagion of the plague will not ſpread the diſeaſe in an atmoſphere not favorable to its propagation. He informs us, that the diſeaſe ſpread from Marſeilles, in ſpite of all precautions, and infected more than fifty villages of Provence. This was aſcribed to infected goods conveyed from Marſeilles. Yet the ſurrounding provinces of Languedoc, Velais, Dauphiné and others, which he acknowledges to have been inundated with goods from the ſame city, eſcaped all infection. In Provence, the diſtemper reached the inhabitants of mountains and was not even arreſted by the rigors of winter; while in the adjoining territories, no perſon was affected, tho equally expoſed to infection. The author remarks further, that the diſeaſe paſſed over ſome villages, and infected others beyond them; for which no reaſon could be aſſigned, while all were alike expoſed.

Theſe facts were very ſurpriſing and unaccountable to the author, Chicoyneau ; yet there is no difficulty in explaining them, on the principle for which I contend ; that the propagation of the diſeaſe depends entirely on a favorable ſtate of the atmoſphere, and not the leaſt on contagion.

Almoſt all the ſuppoſed inſtances of infection from merchandize, related in authors, when inveſtigated, are found to be mere ſuppoſitions and conjectures, raiſed and ſpread by vulgar credulity, without the leaſt foundation, and afterwards recorded as facts, by medical writers, who are infinitely leſs excuſable, than other people. I have inveſtigated many ſuch inſtances in America, where reports had become popular, and grown into ſuch credit, as to be generally believed and received as facts, and I have, in every caſe, found evidence amounting to demonſtration, that thoſe reports were idle ſurmiſes, very often puerile in their origin, and utterly unſupported by facts. Some of the received opinions, in regard to the imported infection of plagues in Europe, when ſubjected to careful ſcrutiny, prove to be equally deſtitute of foundation. Among theſe, are the opinions, received and recorded by grave writers, relative to the London plague of 1665, and that at Marſeilles in 1720.

The ſuppoſition that the plague was conveyed from Marſeilles into fifty villages of Provence, by means of merchandize, appears to be no better founded. Setting aſide the errors of vulgar tales, in which ſuch opinions uſually originate, it is utterly againſt all probability that goods ſold from ſhops and warehouſes ſhould contain infection. If they are ever infected, it muſt be by being uſed by the ſick ; but the ſick do not uſe the goods in ſhops and ſtores ; they are confined to their rooms ; and rarely indeed are their bedding and clothes, ſent to market. Goods, the moſt ſuſceptible of infection, as woollen and cotton, may lie in ſtore during the plague, without any taint that can excite diſeaſe. In America we know this to be fact. In every town, where the fever has prevailed, ſhops and warehouſes filled with ſuch ſorts of goods, are open long after the diſeaſe has appeared, and until the air of the ſtreets has become ſo peſtilential, as to excite the diſeaſe in a few hours in healthy ſtrangers ; nay, ſome of theſe ſhops are open, during the whole time, of the rage of our worſt plagues; yet even cotton and woollen cloths have never, in any inſtance, contracted infection ſo as to communicate the diſeaſe afterwards to thoſe who handled or uſed them. I will venture to aver that all the reports in Europe about the propagation of the plague from town to town, and country to country, by merchandize, are the offspring of vulgar tales. It is poſſible that garments *worn by the ſick* and *not cleanſed*, may excite the diſeaſe in a ſound body; but ſuch garments, to retain the infection, muſt be cloſely packed in bales, cheſts or boxes, or the action of the air will deſtroy the infection, in a few days. And whenever an inſtance of this kind happens, the diſeaſe will die with the patient firſt infected; it will rarely or never ſpread, unleſs the conſtitution of air is ſo peſtilential, as to produce the diſeaſe without infection.

In theſe poſitions, I am warranted by a multitude of facts related of European plagues, and many that have occurred in America.

Hence, goods tranſported from Marſeilles, during the plague, did *not* communicate the diſeaſe in Languedoc, Velais or Dauphiné. The true reaſon of the facts related by Chicoyneau, is, that the air of the whole country about Marſeilles was peſtilential, and affected moſt of the villages in Provence, altho ſome eſcaped. Further removed from the ſea ſhore, in the contiguous provinces, the air was leſs peſtilential, and the diſeaſe did not appear. Goods were conveyed to all theſe provinces indiſcriminately; but they had no concern in the propagation of the plague. The plague appeared, where the peſtilential principle was competent to produce it, the ſeat of which was at Marſeilles, a large populous city; but which extended, as it always does, to ſome diſtance, beyond which it produced no plague. Wherever the diſtemper appeared, vulgar ignorance aſcribed it to goods; and where it did not appear, after the reception of goods from Marſeilles, the vulgar and the learned all agreed they could not account for it; they wondered that goods would not infect people in Languedoc, as woll as in Provence—and all the writers on the ſubject in Europe, from that time to this, ſeemed to have been ſatisfied with wondering at the phenomenon.

Of the truth of the doctrin, that the plague will not ſpread from infection, in an atmoſphere not proper for it, we have in America moſt indubitable evidences.

In every peſtilence that has affected our cities for ſix years paſt, great numbers of perſons, when ill, have been removed into the country, or have been ſeized after removal, but not one inſtance occurred of the ſpreading of the diſeaſe in the country to any extent, from ſuch infected perſons until the year 1798. There have been a few ſcattering inſtances, in which the nurſes of ſuch perſons have received the diſorder. Theſe have been very rare; probably not in one inſtance of a hundred, has any perſon been affected by fomites from ſuch diſeaſed perſons. Moſt violent caſes of the peſtilence, when removed into a pure air, exhibit no infection that is perceptible. This fact correſponds with what has been related of the importation of infected perſons and goods into Egypt in June, July and Auguſt, which produces no ill effect; but for a very good reaſon; the air of that country, during the inundation of the Nile, will not *generate* the plague; and hence the vulgar idea, that it is not imported, or will not ſpread from infection.

But not only do our country people eſcape infection, from diſeaſed citizens who ſicken and die in their houſes, but our cities alſo, when the conſtitution of air does not favor the diſeaſe, are not affected by the introduction of the worſt caſes from neighboring cities. Thus in 1793, many perſons from Philadelphia, entered New-York, in ſpite of precautions, taken by the police, ſickened and died in boarding houſes and other places, but without communicating the diſeaſe in a ſingle inſtance. In 1795, the caſe was reverſed; New-York generated a contagious fever, but Philadelphia did not; and ſeveral perſons, who left New-York, ſickened and died in Philadelphia without infecting any perſon whatever.

It is unneceſſary to multiply examples; the ſame has happened between Philadelphia and Baltimore; between Norfolk and the adjacent country; between Boſton and Providence; in ſhort there is not an exception to the remark, that infected perſons, carried into towns and cities where the atmoſphere has not been diſpoſed to *generate* an epidemic, have never propagated the diſeaſe. In every caſe, and the inſtances have been very numerous, the diſeaſe has diſappeared with the recovery or death of the firſt or ſecond patient.*

But this is not all. In the ſame town or city, where the peſtilence has been general in a particular quarter, another part of the town or city, ſituated on better ventilated or more elevated land, has not only been free from the epidemic, but has poſſeſſed an air capable of reſiſting the infection of the diſeaſed. This, to a certain degree, was the fact in Philadelphia, where no part of the city can be called *elevated;* yet in 1793 and 1797, few caſes of the fever occurred in the weſtern part of the city. But in New-York, New-Haven, Providence, New-London, Boſton, and Newburyport, the diſeaſe has had its peſtilential region, or quarter of the town, in which it became epidemic and infectious; but other parts of the town have been free from it. And in all ſuch inſtances the moſt malignant caſes, in perſons ſeized in the peſtilential region, and conveyed to the healthy part of the town, have exhibited no infection; or if a ſingle nurſe has taken the diſeaſe, of which I have heard of two or three inſtances, the infection has there ceaſed and produced no further effects.

Theſe exempted parts of the towns are the more cleanly and airy ſituations. To this however occur two exceptions. One in Philadelphia, in 1798, the diſeaſe of which year was more virulent and more infectious, than in former years, and extended to healthy poſitions. The other exception is in New-London, the laſt ſummer alſo; in which town, the diſeaſe had indeed its peſtilential region, marked diſtinctly, as before related; but this part of the town, where the diſeaſe raged, is as airy and well built, as any other quarter.

Evagrius remarked of the plague in his time, that it ſometimes attacked certain parts of cities, and left others untouched. See the year 590.

Peſtilential diſeaſes then have an atmoſphere in which they rage with violence ; but at a diſtance, they loſe the power of infecting, at leaſt to a great degree. Van Swieten remarks this of the ſpotted fever in 1756—if healthy perſons deſcended into the valleys where it was prevalent, they took the diſeaſe ; but when removed into more airy ſituations, they infected no one.

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* In 1798 the firſt caſes of the fever in Cheſter and Wilmington originated from Philadelphia; but the atmoſphere alſo of the country in New-Jerſey and Delaware actually *generated* the diſeaſe, in the neighboring diſtricts, and ſo it did in Connecticut.

Vol. 16. 59.

Theſe facts all concur to eſtabliſh the principle, that ſome other cauſe muſt act with infection, to render this peſtilence epidemic, or to give it effect. The conſequence is unavoidable, that the infecting cauſe, is *not* a *ſpecific contagion.*

In the ſecond place, the infecting power of the plague and other autumnal diſeaſes, is ſuſceptible of gradation, from the loweſt point of danger, up to the higheſt ; a circumſtance that does not characterize the ſpecific contagion of ſmall-pox and meaſles. In America, we have ſeen the diſeaſe in every ſtage of virulence, except perhaps the very higheſt, like that in the days of Gallus and Voluſian, that in the time of Evagrius, or that in the reign of Edward III, and a few others. The diſeaſe in Philadelphia in 1797 was more infectious than that in 1793, and that in 1798 ſtill more than either. The fever in New-York in 1795 exhibited very little infection, not one caſe in twenty proceeding from any communication with the ſick ; but in 1798, the diſeaſe put on a more virulent aſpect, and was more generally infectious. In Baltimore, the diſeaſe in 1797 ran through all the grades of bilious fever, from an ordinary remittent, which for weeks prevailed without infection, to a contagious yellow fever.

But this is not all. During the ſame ſeaſon, and in the ſame city, the diſeaſe exiſts in all its grades from an intermittent to the contagious yellow fever. It is a very frequent thing for perſons ſeized with decided ſymptoms of the peſtilential fever, to have the diſeaſe reduced by early applications, to a remittent or an intermittent. Of this I am an inſtance myſelf ; having contracted the malignant fever in New-York in Auguſt 1798, from the air of the city, for I was near no diſeaſed perſons, and returned home, I was ſeized with the ſymptoms, tho not of the moſt violent kind. The fever was diſturbed by early remedies, and I became convaleſcent ; but in a few days, I relapſed and the fever took the form of a regular tertian. Dr. Ruſh relates ſimilar examples in the fever of 1793.

Lind, on diſeaſes of hot climates, p. 179, remarks, that patients, with a mild intermittent, ſent to Greenwich hoſpital, near a marſh, in Jamaica, ſoon grew worſe, and their diſeaſe turned to a malignant yellow fever or mortal dyſentery.

A multitude of ſuch facts have been obſerved in America, which, with the remarkable hiſtory of the diſeaſe in Baltimore in 1797, ſeem to amount to a demonſtration, that the plague and all autumnal bilious diſorders, are of one ſpecies, differing only in their grades. Indeed the writers on the Levant plague, while they utterly deny ſuch a ſameneſs in kind between that diſeaſe and any other, have recorded facts to prove the doctrin here maintained.

P. Ruſſel admits that the plague in Aleppo was of very various degrees of malignity, and was not always infectious. He has even arranged the caſes in ſeveral diſtinct claſſes, according to the various ſymptoms and degrees of mortality.

Lady W. Montague, in letter 31, has the following obſervations. " Thoſe dreadful ſtories you have heard of the plague, have very little foundation in truth. I own I have much ado to reconcile myſelf to the ſound of a word which has always given me ſuch terrible ideas ; tho I am convinced there is little more in it than in a fever." She then proceeds to relate, how ſhe paſſed through ſeveral infected towns, that her cook was taken ill, and ſhe was told, with a great cold—that ſhe left her doctor to attend him, but the cook ſoon recovered, and both cook and doctor in a few days, arrived in health at Adrianople. She was then ſurpriſed to learn, that her cook had been ill with the plague. She concludes, from her own experience, that the air is never infected and that it is as eaſy to root the plague out of Turkey, as out of Italy and France.* She remarks alſo that " many eſcape it"—which is certainly wonderful !

Juſt ſo careleſsly people reaſon and draw concluſions, from a ſingle curſory obſervation, or an iſolated fact; a practice among travellers, as among men of pretended ſcience, which is the ſource of numberleſs errors. It is undoubtedly true, that the plague is often "little more than a fever;" but if Lady Montague had been in Cairo in 1580, or in 1736, or in Conſtantinople in 543, or in 1751, or in London in 1665, or in Marſeilles in 1720, ſhe would have thought the plague ſomething more than an ordinary fever. The truth is, the diſeaſe exhibits different grades of violence, at different times.

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* Notwithſtanding this diſeaſe was " rooted out of France," it happened that, in two years after Lady Montague wrote her letter, Marſeilles was almoſt depopulated by the diſeaſe !

Savary remarks, that ſuch as *catch* the plague in Egypt in June, July and Auguſt are always cured.

So obſerves Mignot, in his hiſtory of the Turkiſh empire, vol. 2. p. 4, "the plague at certain times, is incurable; at others, eaſy to be cured. The contagion is more or leſs ſtrong, according to the ſtate of the air."

Similar remarks occcur in the Traité de la peſte. The author is full of his idea of contagion, but he ſays, the plague, tho always from one cauſe, appears differently in different places, and a ſmall diſtance between them makes it appear like two different diſeaſes, as at Montpelier and at Lyons.

Chandler, in his travels, gives us wonderful diſcoveries on this ſubject. He ſays, the diſeaſe proceeds from certain inviſible animalcules, burrowing and forming their neſt in the human body. Theſe are imported annually into Smyrna—they are leaſt fatal at the beginning, and latter end of the ſeaſon. If they arrive early in the ſpring, they are weak, but gather ſtrength, multiply and then periſh ! !

Such ſilly opinions are gravely recorded in books, yet they prove that infection is of very different degrees of ſtrength, or that it is the ſtate of the air, and not infection, which produces the diſeaſe.

P. Alpinus, followed by Volney, Savary and others, ſpeaks of this difference in the malignity of the plague; but he aſcribes it to the *place* where the diſeaſe originates. He ſays, the contagion from Barbary is more putrid and virulent, than from Greece and Syria, and inſtances that of 1580.

Vol. 3. p. 61 and 2.

It is true that ſome of the moſt violent plagues have firſt appeared in Ethiopia or Barbary, as in the time of Thucydides, in 252, in 1580, in 1736 ; but theſe writers ought to have recollected that others equally violent have originated in Egypt, in China, in Italy and in Conſtantinople. Witneſs that in 542 which began near Peluſium in Lower Egypt, thoſe of 1347 and of 1450 which began in China or other parts of Aſia, and that of 745 which commenced in Calabria, in the kingdom of Naples. They might have obſerved alſo, that many plagues, of the moſt deſtructive kind, have appeared at once in twenty or more of the cities of Europe. Theſe conſiderations would have detected the puerilty of the notion, that contagion from one country is more "putrid and virulent" than from another, and led the obſervers of nature to the true cauſe of theſe different grades of malignancy, different ſtates of the atmoſphere in different periods.

Fernelius divides epidemics into three kinds : An epidemy from exhalations or vapor from the earth ; from great changes of ſeaſons ; and from an occult, malignant quality in the air ; the laſt, he maintains, is the only true cauſe of the peſtis ; the others are preparatory to it ; but theſe cauſes often unite, and the plague then becomes moſt ſevere. Putrid exhalations do not alone produce the plague, but prepare for it and aid its progreſs. Hence it does not affect all places or all men alike—but is moſt ſevere in maritime places ; in thoſe expoſed to the ſouth ; warm and humid, abounding with impure exhalations.

De Morb. Peſt. 189.

There is a great deal of truth in theſe obſervations, and I cannot but remark how much more correct theſe authors are who often ſaw the plague, than Mead and others who had no ſuch advantages.

The violence of the peſtilential principle, aided by ſeaſons remarkably debilitating, has ſometimes diſpatched the human race, with terrible rapidity. The more uſual courſe of the plague is from five to ſeven days, when death or a favorable criſis takes place. But to this there have been ſome diſmal exceptions. The diſeaſe deſcribed by Evagrius in 590, generally put an end to life in three days. This alſo was the period of the criſis in the dreadful plague, in the days of Vortigern, in 448, and the ſubſequent years. In the ſimilar calamity of 1348, few patients lived beyond the third day.

In many inſtances, during theſe more general plagues, perſons have died ſuddenly, as in an apoplexy; as in the peſtilence at Narbonne in 1534, where men frequently fell dead as they were walking or converſing; of which Skenkius himſelf was often an eye-witneſs. He cites as authorities for the ſame fact, Valleriola, Gemma, Salius and Cardanus. See page 765. The ſame happened in the peſtilence deſcribed by Evagrius; and authors relate that no leſs than eighty perſons, fell dead in a proceſſion inſtituted by St. Gregory, about the year 590.*

Dion Caſſius mentions an expedition of a Roman army into Arabia Felix; in which moſt of the ſoldiers periſhed by unuſual diſtempers. Many of them were ſeized in the head; the brain diſſolved, and the diſeaſe falling upon the throat, ſuffocation ſpeedily ended life. This was evidently the effect of extreme heat, producing exceſſive excitement and ſoon followed by a total debility of the nervous ſyſtem.

Terrible indeed muſt be that virulence of the peſtilential principle, which bids defiance to cold. Yet ſuch has been the caſe in a number of plagues. In the peſtilence of 543, ſays Procopius, the diſeaſe invaded ſome places in ſummer; others in winter. Evagrius makes the ſame remark of the plague in 590. The black peſtilence of 1348 attacked countries, in northern latitudes, in winter or ſummer, without diſcrimination. The diſeaſe in Provence in 1720, was not controlled by the rigors of winter. The peſtilence in 1591, raged thro a cold winter, in Revel and Narva, in the 59th degree of north latitude. "Sometimes, ſays Fernelius, the moſt intolerable heat of ſummer produces no peſtilential diſorder; at others, the plague breaks out in winter, and ceaſes in the midſt of ſummer or in autumn." p. 189.

Diemerbroeck remarks that a plague which begins in winter or autumn, is more violent and of longer duration, than one which begins in other ſeaſons. So ſays Peter Paſchal, an author cited by Diemerbroeck; the plague which begins in ſpring or ſummer ends in winter; that which begins in autumn or winter, is of longer continuance.

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* This diſeaſe ſometimes attacks in the form of an apoplexy; in other caſes, perſons are indiſpoſed, for ſome days, but able to walk, while the diſeaſe is ſecretly undermining the animal powers. Such perſons ſuddenly paſs from apparent health to their graves.

The reaſon of this diverſity is very obvious. The peſtilence which appears in winter, in northern latitudes, can proceed only from a diſpoſition of the atmoſphere; for cold totally deſtroys all infection of that diſeaſe, and all the influence of putrid exhalations. Whenever therefore the plague invades man in cold weather, it demonſtrates a *more malignant* ſtate of the air, and one that is not controlled by cold weather or froſt. Such a ſtate of the air muſt of courſe produce more fatal effects, than an inferior force in the peſtilential principle, which perhaps requires the aid of heat, humidity and noxious exhalations to produce a very violent plague. Thanks to heaven, moſt of the peſtilences that afflict mankind are of this latter, or ſubordinate degree; in which the real plague is limited to places highly charged with morbid ſubſtances, which it is in the power of man to diſſipate or remove. A vaſt proportion of all peſtilential diſeaſes are found to rage only in cities, jails, camps, and crowded ſhips, and may be avoided or mitigated by human means.

At the ſame time, hiſtorical facts warrant me in believing, that the peſtilential principle does, at times, acquire a virulence, that proves fatal to life, in every ſeaſon and every ſituation; aſſailing indiſcriminately the city and the cottage; the cleanly dwellings of the rich and the filthy cells of the poor; the higheſt hills, as well as the valleys, the borders of moraſſes, and the nauſeous alleys of a populous town. During this melancholy ſtate of the elements of life, and ſuch was their condition during the ravages of the black peſtilence in the reign of Edward III. men are however not to deſpair of preſerving life; but the means conſiſt in applications to the human body, calculated to guard, not againſt infection ſo much, as againſt *debility*, the deciding proximate cauſe of the malady.

Hiſtorians mention a remarkable difference in the operation of the two very furious plagues, in 1348 and 1361. That of 1348 was moſt fatal to the poor; but that of 1361 was moſt mortal among the nobility and gentry, and on hills and mountains, which uſually eſcape. In the firſt caſe then, morbid exhalations conſtituted an influential cauſe in producing the malady—in the latter caſe, they operated as a ſhield or antiſceptic—and the facts demonſtrate the various force of the elemental cauſes.

In the third place, to give effect to the infection of the plague, and at times, to other autumnal diſeaſes, there muſt be an apt or ſuitable diſpoſition in the human body. This is admitted by Hippocrates, who obſerves that body differs from body, the nature of one man, from that of another, the nutriment of one, from that of another, and the ſame things are not alike pernicious to one ſpecies of animals, as to another. Hence he accounts for diſeaſes invading one kind of animals at one time, another ſpecies at a different time, and different ſpecies having their various diſtempers.

Lib. de flatibus.

Thus Galen remarks, that the ſame cauſes do not affect all perſons alike ; if they did, violent heat, exceſſive fatigue or drinking or anger, or grief, would produce fever in every perſon ; and for the ſame reaſon, all perſons alike would be ſeized with peſtilence, during the reign of the dog-ſtar.

De dif. feb. cap. 4.

In conformity to theſe ideas, Diemerbroeck, p. 50, lays it down as a principle, that no perſon will receive infection, unleſs his body has an *aptitudinem*, a fitneſs, or diſpoſition to receive it, ariſing from ſome ſecret quality or bad ſtate of the ſyſtem.

On this point, we reaſon without knowing cauſes ; all we can do is to collect and arrange facts, which decide in favor of this hypotheſis. We are compelled to admit the principle, not only as it reſpects the operation of infection, but alſo of the elemental or primary atmoſpheric cauſe of peſtilence, which makes an evident diſtinction, at times, between perſons of different habits, families, and nations.*

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* Medical men are not agreed, as to the nature of what is called *prediſpoſition*. Brown, in Elements of Medicin, defines it to be a leſs degree of the diſeaſe ; that is, the commencement of the diſeaſe. I ſuſpect this definition, properly limited, to be nearly juſt. It is probable that all fevers are the effects of debility, and that when this debility commences, a perſon may be ſaid to be *prediſpoſed to diſeaſe ;* altho the diſeaſe may not be formed in many days or weeks after, or may be prevented by early applications.

Theſe facts came under the obſervation of Procopius and Evagrius. In 543, ſays the former, no phyſician or attendant caught the diſtemper—while many were ſeized they knew not from what cauſe and ſuddenly died. Many, ſays Evagrius, who fled from infected places, remained ſafe themſelves, while they communicated the diſeaſe to others. Many who remained with the ſick and freely handled them, wholly eſcaped. Others, in deſpair for the loſs of friends, threw themſelves in the way of infection, but were not able to contract the diſeaſe ; while others received the diſeaſe by the ſlighteſt connection with infected houſes, or in open market.

We have many memorable examples of a ſimilar nature in America—they are too numerous to be ſpecified. I ſuſpect however that four fifths of ſuch caſes are improperly aſcribed to infection.

Diemerbroeck relates that in the height of the plague at Nimeguen, the air was ſo bad, that all places were nearly alike, as to the danger of infection ; perſons received the diſeaſe with or without intercourſe with the ſick.

Sometimes the plague diſcriminates between natives of different countries. The French fugitives from the Weſt-Indies, who have reſided in our cities during peſtilence have generally eſcaped. This is not however very remarkable ; as they are accuſtomed to a climate which is, like our ſummers, peculiarly fitted to produce a ſimilar diſeaſe ; at the ſame time, their manner of living is better ſuited to the warm ſeaſon, than that of our own citizens.

But a ſimilar diſcrimination has been often obſerved, among natives of the ſame latitudes, or nearly the ſame. Thus Cardanus, lib. 8, relates that in a peſtilence at Baſle, the Swiſs only were affected ; the French, Italians and Germans eſcaped. John Utenhovius relates that in a plague in Denmark, all ſtrangers, as Engliſh, Germans and Hollanders eſcaped, altho they reſided in families and aſſociated freely with the infected. The Sudor Anglicus, when it firſt appeared in England, attacked none but the Engliſh ; but in ſubſequent peſtilential conſtitutions, it invaded almoſt all Europe.

We have in America moſt illuſtrious examples of the diſtinction above mentioned. In the ſweeping peſtilence of 1618, when almoſt all the Indians periſhed, on a tract of three hundred miles in extent, ſome white men wintered in the country and aſſociated freely with the ſick, without injury. In a ſimilar peſtilence among the Indians on Nantucket, in 1763, not a white man was affected, tho never ſo much expoſed to infection. Two or three other inſtances have come to my knowledge. A like diſcrimination took place in Egypt in the time of Moſes.

Sometimes the plague ſingles out particular families. Thus Diemerbroeck obſerved in the plague at Nimeguen, whole families, by a ſecret ſympathy, were ſeized all at one time; and in ſome inſtances, where the members of the ſame family lived, at a diſtance from each other, in different parts of the city, they were all attacked nearly at the ſame time. What is more remarkable, the ſame fact was repeatedly obſerved, where the members of the ſame family lived in different towns. Of this there were many exemples. One man by the name of Van Dans, to preſerve his children from infection, ſent two of them to Gorcum in Holland, to reſide with his friends, and kept the third at home. There was no peſtilential diſeaſe in Gorcum, at that time, and the two children remained in health for two or three months; but at laſt both were ſeized with the plague and died, at the ſame time that the father and another child died with it in Nimeguen. The mother was ſeized, but recovered. About the ſame time, a ſiſter, and two or three other children, reſiding with another ſiſter, at a diſtance, and ſeveral more remote relations of the family, all periſhed with the ſame diſeaſe.

So it is related by Evagrius, who was ſurpriſed at the fact, that particular families, ſometimes only one or two, were arreſted by the plague, while all the other inhabitants of the city remained in health. But he remarks further, that thoſe who eſcaped, the firſt year, experienced the like calamity in the next. This fact, by the way, is common, and ſhould have led Evagrius and others to obſerve the progreſſiveneſs of the peſtilential cauſe.

Pliny, lib. 7. ca. 50, remarks that old people are uſually exempt from attacks of the plague; but that all nations are ſubject to peſtilential diſeaſes, which invade them by kinds or claſſes;

ſometimes falling on ſervants, ſometimes on nobles, and on others by grades or ranks. Nature, ſays this author, has even preſcribed certain laws to diſeaſes. The laſt remark ſhould have excited the minds of phyſicians to diſcover theſe laws. Such laws certainly exiſt, and epidemics of all kinds are connected in principle.

I have met with other inſtances of diſcrimination, perhaps more remarkable. One is related from John Helwigius, in Bonetus' Collection of Northern Medicine, page 228. In 1621, when the ſmall-pox raged with great mortality, it was remarked that perſons of the ſame blood, as brothers, couſins and other relatives, living at a great diſtance from each other, and as far as from Nuremberg to Lyons in France, were ſeized with the diſeaſe at one and the ſame time. I draw no important conſequences from this fact, becauſe this diſeaſe is not *limited* to particular families, altho it may ſeize one family before it does another.

Another inſtance is related by Van Swieten, Vol. 16, from Heiſter, an author of undoubted credit. At Altdorf, in Franconia, broke out in 1711, a malignant fever, approaching to the plague in violence, but not with the glandular tumors. This diſeaſe attacked none, but the ſtudents or others of the univerſity; but it ſeized them wherever they were diſperſed in private families, in all parts of the town. It ſeized the profeſſors alſo and their families, but went no farther by infection. It attacked alſo the printer to the univerſity and his workmen, tho at a diſtance from the college; while another printer, contiguous to the college, eſcaped. Students alſo belonging to the univerſity, tho at home, as at Nuremburg, were ſeized. It was thus reſtricted in its attacks, and exhibited no infection, beyond theſe deſcriptions of perſons.

It muſt not be omitted, that this was a very ſickly period in all the north of Europe. In this ſame year, the plague raged in Copenhagen, and it had in the preceding years, ſpread over Poland and along the Baltic.

This fact at Altdorf is by far the moſt ſingular, that I have found in hiſtory; but that a violent diſeaſe ſhould attack perſons of one blood, and not of another, is leſs ſurprizing. We have recent proofs of this diſcrimination in America. In 1796, three perſons of one name in Hartford, two brothers and a couſin, were ſuddenly ſeized with a violent fever, of a putrid tendency, tho in winter, and carried off within a few days of each other. At the ſame time, two or three others of the family were ſeized leſs violently in the ſame town and recovered ; and what is more ſingular, two other brothers, one in Litchfield, 30 miles from Hartford, and another in New-York, 130 miles diſtant, were attacked nearly at the ſame time, and were very ill, but ſurvived. No infection could have exiſted in moſt of theſe caſes, as the perſons did not ſee each other.*

Another inſtance occurred in Cambridge, Maſſachuſetts, and is ſtated to me by the attending phyſician.

In October 1791, a young woman, belonging to a family in that town, but who had, for two years, lived at a diſtance of three miles from her father's houſe, was ſeized with a putrid bilious fever. Her mother repaired to the place and nurſed her, till ſhe was convaleſcent. None of the family viſited her while ſick, except the father occaſionally, and her eldeſt ſiſter. The latter took the place of the mother, for a few days, who was called home to attend two other children who were ſeized with the ſame diſeaſe, and who had never been expoſed to infection. Before theſe recovered, three others were taken with the fever in the ſame family. The three laſt had doubtleſs aſſiſted in nurſing the ſick or been into their rooms, and therefore might have been infected.

In April following, another of the children, who had lived at a diſtance from the family and had not been permitted to ſee any of the ſick, was ſeized with the ſame fever, at the houſe where ſhe lived. In the ſame month, the father and another child, were taken with it at home. Not one of the family, at home or abroad, eſcaped, except the mother, who had nurſed all the ſick, except one, and was moſt expoſed to infection. The diſeaſed were very offenſive, but all recovered, except one; and neither my informant, the attending phyſician, nor any nurſe or viſitor, out of the family, was in the leaſt injured by infection.

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* A curious fact is related to me by Dr. Dutton of Oxford, in Derby. In the year 1795, almoſt every *male* child, born in the beginning of the year, in that and the adjacent towns, died within a fortnight by convulſions, but *no female* child was affected. This was obſerved to be more frequent in families that had been affected by the ſcarlatina, in the preceding year.

It will be remarked that this was near the diſtrict of country which had ſuffered by a peſtilential fever and dyſentery.

M. S. letter from Dr. Wm. Gamage.

This diſeaſe was a family peſtilence, which began in autumn, was ſuſpended by the cold of winter, and revived in ſpring. It reſembles, on a ſmall ſcale, the great plagues in London and Marſeilles, and many others, in which a few caſes occurred, in the preceding autumn, clearly marking a peſtilential ſtate of air, in that particular city, which ſtate was arreſted in its operation by cold in winter, but again exhibited its effects in ſpring.

The limitation of the diſeaſe to a particular family, of the ſame blood, or diſpoſition to be affected by a certain morbid ſtate of air, is a myſterious phenomenon, but the fact is ſo well aſcertained, as to leave no room to queſtion its exiſtence. We can aſcribe it only to a general ſtate of air, fitted to produce injurious or fatal effects on bodies of a particular temperament, which temperament or diſpoſition conſiſts in the inviſible ſtructure or organization. It is demonſtrated that infection cannot be the only cauſe of the diſeaſes in theſe families; and of courſe we are compelled to admit the exiſtence of another cauſe, which can only be the atmoſphere, for no other cauſe extends its operation to the diſtance at which the effects were produced.

It is on this principle alone that particular perſons or families eſcape the worſt plagues that have afflicted mankind, as related by Evagrius, and all authors on the ſubject, and of which we have numerous inſtances in America. But,

"Why drew Marſeilles' good biſhop purer breath,
When nature ſickened and each gale was death?"

is the interrogatory of an inimitable poet, which has never been anſwered; for on this ſubject, as on every other, we are baffled and confounded, when we attempt to reach primary natural cauſes. The interior organization of animals and vegetables, is far beyond the limits of human inveſtigation.

Lord Veruclam has left a paſſage confirmatory of the foregoing principles. " The plague, ſays this great obſerver of facts, is not eaſily received by thoſe that continually attend the ſick, as phyſicians; nor again by old people, and ſuch as are of a dry, cold complexion. On the other hand, the plague ſooneſt ſeizes thoſe that come out of freſh air, thoſe that are faſting and children. It is alſo noted to go in a blood, more than from ſtranger to ſtranger."

Works, Vol. 3.

It is in analogy with the foregoing facts, that animals of different ſpecies are affected with epidemic diſeaſes, which bear a ſimilitude in their predominant ſymptoms, at different ſtages of a peſtilential conſtitution of air. Sometimes, horſes, cattle and ſheep feel the operation of the deſtructive principle, at the ſame time with man. At other times, this principle will affect cattle a year before it reaches mankind. Sometimes, it firſt aſſails the human race, and afterwards the irrational parts of creation. In ſome years one ſpecies of animals is affected ; the next year, another. Thus horſes experienced the epidemic of 1793, in the vicinity of Philadelphia, in the winter following the plague in that city. The cats periſhed in 1797. The fiſh in James' river died in 1797, the oyſters on the ſhores of Connecticut ſickened in 1794, and the fowls in Connecticut in 1796.

Not unfrequently, the force of the peſtilential principle, in one country, ſeems to expend itſelf principally on the brute creation ; while, in the ſame year, or ſucceſſion of years, its principal operation, in a neighboring country, is experienced by mankind. Thus in 1712 and 13, a very peſtilential period, the cattle in Italy, Germany and other places received the full force of the peſtilence, in a deſolating epidemic, while in Auſtria, Hungary and the eaſt, the peſtilence fell on men. Thus alſo in 1770, while a dreadful plague was raging in Turkey and Poland, a mortal diſtemper ſwept away the cattle in Holland, Flanders and ſome parts of England, and malignant fevers prevailed in ſome parts of America.

That the great general cauſe of the diſeaſes, among the different ſpecies of animals, is the ſame, is obvious from this conſideration, that during the ſame conſtitution of air, or peſtilential period, the diſeaſes of man and beaſt have a number of ſimilar ſymptoms; ſuch was the fact in Auſtria, Italy and Germany in 1712 and 13; and ſuch has been the caſe in the United States.

In conformity with the general principle above mentioned, we obſerve that however analogous may be the ſymptoms of diſeaſes in man and beaſt, the diſtempers of one rarely infect the other. Infection is limited uſually to that ſpecies of animals, which have an aptneſs to receive the operation of the primary atmoſpheric cauſe of the diſeaſe. Thus diſeaſed horſes do not infect men, nor diſeaſed men, horſes. So when a plague attacks the natives of a particular country only, the infection, like the primary cauſe of the diſeaſe, is reſtricted in its operation to thoſe particular people. But this is rarely or never the caſe with the ſpecific contagion of the ſmall-pox and meaſles, in regard to mankind.

Authors indeed relate that hogs, dogs and poultry, feeding on highly infected articles, or wallowing in the filth thrown from houſes, during the plague, have died with a ſimilar diſeaſe. A few inſtances are mentioned by Diemerbroeck, Boccace and others. Hodges mentions a diſeaſe taken from a horſe, which ceaſed without becoming epidemic.

But theſe iſolated facts form no exception to the general rule; for ſuch diſtempers never ſpread and become epidemic. They only prove my general doctrin, that the contagious quality of plague, is not a ſpecific principle, but a quality capable of every poſſible degree of force—that in its lower or more attenuated forms, it affects few or no perſons whatever; but it *may* be ſo concentrated or condenſed, as to deſtroy life, not only in bodies of an aptitude to receive the poiſon, but alſo in other ſpecies of animals, which have no ſuch aptitude. Hence, the poiſon generated in the clothes of the ſick, when put into cheſts or packages, uncleanſed, in hot weather, may be ſo concentrated or increaſed by fermentation, as to kill almoſt inſtantly, the perſon who opens them. But an infectious diſeaſe thus produced, will never ſpread far, without the aid of a ſtate of air which is peſtilential. On the other hand, from thouſands of inſtances in books, and within the knowledge of Americans, who are annually, monthly and weekly receiving infection from the Weſt-

Indies, we know that the infection ſoon diſappears in a healthy conſtitution of air. It may be ſo virulent as to give diſeaſe to the perſons who firſt approach it; but in theſe the diſeaſe is extinguiſhed.

It ſhould be further remarked, as a uſeful hint, that perſons removing ſuddenly from freſh air to an infected place, are doubly expoſed. The increaſe of the peſtilential cauſes is uſually gradual; therefore perſons who live within their operation, are inſenſibly fitted, by the flexible texture of the ſyſtem, to ſuſtain their effects. But ſudden changes are very dangerous. The body will hardly ever ſuſtain great changes in the powers of excitement, when ſuddenly made. Hence the extreme danger of removing from freſh to infected air; and ſometimes, of removing from infected to freſh air. The ſudden alteration in the ſtimulus operating on the ſyſtem, may be as fatal in one caſe as the other.

Another diſtinguiſhing circumſtance, in peſtilential diſeaſes, and one that deciſively marks different grades of violence in the cauſes, is, the manner in which the diſeaſe invades neighboring cities. It is always obſerved, that during the prevalence of the plague, it attacks cities or towns at ſome diſtance, in one year, leaving other towns in the intervals between them, untouched; the next year perhaps, or the ſecond year after, it invades thoſe intermediate towns which had eſcaped. This is always the fact, and it has puzzled all authors who have related it; yet the fact has never been accounted for, as its cauſes have never been underſtood. Mead, who was not perſonally acquainted with this diſeaſe and whoſe theory led him to explain all its phenomena by contagion, was greatly embarraſſed with this fact. He inſtances the eſcape of Vicenza, in Italy, 1575, when Verona and Padua, one on each ſide of Vicenza, were ſeverely afflicted; and in the next year, Vicenza was deſolated, when Verona and Padua were exempt. He could not explain how the infection, which came from Trent, where the diſeaſe firſt appeared, ſhould *paſs over Vicenza* and reach a more diſtant city.

Erroneous theories are the ſource of innumerable miſchiefs in ſcience. The fact is a common one, and on a juſt view of the cauſes of peſtilence, is very eaſily explained. And what is ſurprizing, Procopius and Evagrius have recorded facts which afford a clue to the ſecret, altho medical writers, from their days to the preſent time, have ſuffered them to paſs without notice. Procopius mentions that the peſtilence which began in 542, ſpread over the earth, but "if it paſſed by a particular country at firſt, or *ſlightly affected it*, it ſoon returned upon it with the ſame deſolating rage, which other places had experienced." Evagrius alſo remarks, that "ſome places were more ſlightly affected;" and in another paſſage he ſays, that in ſome cities a few families were ſeized the firſt year, and the reſt of the city, the year following.

Here we have a clue to the myſtery. The plague ſeizes firſt the cities and towns where the *general*, or *local cauſes* are the moſt powerful. Thus, the plague of 1575, which puzzled Mead ſo much, commenced in Trent on the Adige, which, all geographers agree, is a moſt unhealthy place. It next attacked Verona and Padua for a ſimilar reaſon, and afterwards Vicenza, the intermediate town. The general cauſe, in the elements, had been four or five years in operation, producing a fatal ſpotted fever, in moſt parts of Europe, continually increaſing in malignancy, until it aroſe to the plague, and its criſis muſt naturally be in places where it was moſt aided by local cauſes, or where the general cauſe firſt increaſed to its full force.

The ſlight peſtilences mentioned by Procopius and Evagrius, were the *precurſors* of the ſevere plagues to follow; preciſely as in London and Marſeilles, a terrible plague was preceded, in a former year, with malignant fevers and a few caſes of plague. All hiſtory affords a tiſſue of proof, that the plague is never an iſolated diſeaſe, ſtarting up ſuddenly from infection; but the *criſis of a ſeries of violent diſeaſes*. To this I challenge the partizans of ſpecific contagion to name an exception.

In America, we are able to ſolve the phenomenon of the eſcape of places intervening between infected towns. We find, without an exception, that when two cities are infeſted with peſtilence, and an intervening place is not, if that intervening town is to be attacked the following year, the precurſors of the diſeaſe appear there, during the peſtilence in the towns on each ſide of it. Thus the late ſeries of plagues *began* in New-York in 1791, in Water and Front ſtreets, where the *local* cauſes were moſt powerful. At this time, appeared ſporadic caſes of bilious fever, more malignant than uſual, in various parts of the country, every where, indicating the commencement of a peſtilential ſtate of air.

In 1792, theſe indications continued, and in a few caſes appeared the ſcarlatina, a new evidence of the reigning conſtitution.

In 1793, the criſis arrived in Philadelphia, with ſerious mortality; and the indications of peſtilence appeared in a great increaſe of mortality, in many parts of the country.

At the cloſe of this year, New-Haven, which was to be next attacked, began to ſhow the forerunners of the diſeaſe, in the ſcarlatina, and in an increaſe of mortality of about one fifth. In the next ſummer 1794 appeared the bilious plague. In the ſame ſeaſon appeared the diſeaſe in Baltimore, diſtant from New-Haven about 290 miles, while Philadelphia and New-York, intervening cities, eſcaped. But let it be obſerved, that a number of caſes of the diſeaſe occurred in Philadelphia; and New-York which was to be aſſailed in the next ſeaſon, produced its precurſors, in about thirty caſes of violent bilious fever, ending in black vomit. Thus while on the extremes, New-Haven and Baltimore were ſeverely viſited, the approaching peſtilence was announced in New-York, by a peſtilential atmoſphere, of a leſs degree of malignancy.

In 1795 appeared the epidemic in New-York and in Norfolk, Virginia; while Philadelphia and Baltimore, intermediate cities, eſcaped, altho the heat and humidity of the ſeaſon every where rendered the country unhealthy. In this year the peſtilential principle ſhowed itſelf in New-London and Providence, in diſtinctly marked caſes of the bilious plague.

In 1796, ſcattering caſes occurred in the northern parts of America. In Newburyport, peſtilence prevailed, but preceded by an increaſe of mortality, its precurſor. The ſame diſeaſe prevailed in Boſton, New-York, and Charleſton, while intermediate towns eſcaped.

In 1797, it appeared in Providence, Philadelphia, Baltimore and Norfolk, while New-York eſcaped an epidemic, but a few very malignant caſes occurred, ſhowing the exiſtence of the general cauſe.

So far as I can diſcover, not a ſpot on the globe has ever been viſited with peſtilence, without its precurſors, ſometimes one, two or three years, but always for ſome months, before its invaſion.*

If we had bills of mortality for Vicenza, in the years 1570 to 1576, or a hiſtory of the diſeaſes in the town, during that period, I pledge myſelf that we ſhould find, that during the plague in Verona and Padua, on each ſide in 1575, ſome malignant diſeaſe prevailed in Vicenza, which greatly ſwelled the bill of mortality for that year, and which announced, with almoſt infallible certainty, the approach of the plague. Inſtead therefore of ſaying Vicenza eſcaped the peſtilence, the firſt year, when Verona and Padua were afflicted, we ſhould ſay, the peſtilence had *commenced* in leſs malignant diſtempers, but its criſis in Vicenza was to be a year later. This is the whole myſtery, and the uniformity of this ſeries of facts from the days of Procopius to this hour, renders it a matter of aſtoniſhment, that medical and other ſcientific men, ſhould have overlooked this great law of epidemic peſtilence.

Diemerbroeck remarks the fact, as well as Procopius and Evagrius, that peſtilence does not invade all places at once, but now this place, now that, and thus, in a ſeries of years, extending over the earth. See p. 50 of Diemerbroeck, and the foregoing hiſtory of the plagues in Juſtinian's reign. But no author ſeems to have obſerved the progreſſion of a general peſtilential principle, which, if it does not occaſion plague in two contiguous towns, the ſame year, occaſions plague in one, and other malignant diſeaſes in the other, which certainly indicate its approach.

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* Thucydides relates that the year of the plague at Athens was remarkably free from other diſeaſes preceding, and that the plague fell ſuddenly on the citizens. This may ſeem an exception to my remark; but is not; for all the neighboring people were collected into the city; which was beſieged; a circumſtance alone ſufficient to account for the ſudden attack of the diſeaſe.

To prove that infection has no concern in this laſt mentioned phenomenon, according to the theory of Mead and others, it may be obſerved that the invaſion of the diſeaſe in cities, is perfectly analogous to its invaſion of a whole country. The diſeaſe rarely begins at one point and ſpreads from that, like the radii from the center of a circle, nor does it follow the nurſes and attendants of the perſons firſt ſeized. On the other hand it ſtarts up in various diſtant parts of the town, among people who have no intercourſe with the infected. To this, it may be alleged, the fevers of Philadelphia in 1793 and 7 are exceptions ; but on critical examination, I find they are not. That in New-Haven may be an exception. Thus Evagrius relates, that at the beginning, the plague ſeized particular families, ſometimes only one or two, and the reſt of the town eſcaped, till the next year.

Baronius from Gregory of Tours has well deſcribed the firſt progreſs of the plague, in 590, in the ſouthern cities of France. He ſays the diſeaſe was introduced by a veſſel from Spain ; the firſt record I can find of ſuppoſed importation by water. But when introduced, it did not ſeize every houſe at one time but left intervals. " Nec ſtatim hoc incendium luis per domos ſpargitur totas, ſed interrupto certi temporis ſpatio, ac velut in ſegetem flamma accenſa, urbem totam morbi incendio conflagravit." Vol. 8. 15. The metaphor here employed will appear ſtriking to thoſe who have ſeen a field of ſtubble or the woods on fire, in a windy day. The fact alſo correſponds exactly with what has been obſerved in London, Marſeilles and other places, that the diſeaſe at firſt ſtarts up here and there, in remote ſituations ; then ſubſides for weeks perhaps, before it ſpreads and becomes popular.

Thus in Nimeguen, a few caſes occurred in November ; then there was an interval of ſuſpenſion ; in January, more caſes, and in March, the diſeaſe began to aſſume the ſhape of an epidemic.

Diem. p. 6.

In London, ſays Hodge, two or three perſons died, in one family, with ſymptoms of the plague in 1664.—In the holidays, occurred another caſe—but a hard froſt ſuſpended the action of the infection. The diſeaſed were at firſt ſhut up and guarded ; but to no purpoſe. An order was iſſued and enforced, that a red croſs ſhould be ſet on infected houſes, with theſe words inſcribed, " Lord have mercy on us."—

In May and June the diſeaſe to uſe the author's own words, "reigned doubtfully;" ſometimes in one part and ſometimes in another; and to uſe Hodges quaint expreſſion, "it kept up a running fight," alternately inſpiring hope and fear. This deſcription is leſs elegant than that of Baronius, but it expreſſes the ſame ideas of the firſt progreſs of the plague.

It is ſtrange however that the writers ſhould not have ſeen that their facts totally overthrow their own ideas of infection; it being impoſſible, that the operation of infection ſhould be thus ſuſpended, and afterwards revived. Froſt totally annihilates infection, altho it does not deſtroy the atmoſpheric cauſe of diſeaſes. Similar, in all reſpects, was the commencement of the plague at Marſeilles in 1720. At firſt a few perſons died ſuddenly, then the diſeaſe diſappeared, and the citizens ſuppoſed it to be ended. Repeated hopes and fears were revived by the alternate appearance and diſappearance of the malady, for ſome weeks in May and June. Yet the author who has related theſe facts made a book to prove its origin from Levant infection! ſo abſurd are men when they attempt to ſupport preconceived ſyſtems!—

In America, the peſtilential fever has firſt made its appearance, in a ſimilar manner. It has every where been preceded by an increaſe of mortality, and in moſt places, has appeared in the ſcattering, interrupted manner of the plagues before mentioned. In Philadelphia in 1797, and ſtill more in 1798, ſcattering caſes occurred in June and July, ſeveral weeks before the arrival of the ſuppoſed fomites, from the Weſt-Indies. The ſame fact occurred in New-York in 1795; ſome caſes appeared two weeks before the arrival of the Zephyr, the ſuppoſed ſource of infection. In Providence occurred the ſame fact.

The whole ſecret of theſe phenomena, is, that infection has uſually nothing to do with the *origin* of the diſeaſe, according to the decided opinion of the learned Diemerbroeck, who ſaw the progreſs of the diſeaſe in Holland, and found it impoſſible to aſcribe it, in many places, to that cauſe.

The reaſon why perſons are ſeized, in remote and ſcattered ſituations and after different intervals of time, is, that the malignant principle is *progreſſive.* In its ſtate of increaſe, it firſt produces diſeaſes of a leſs violent type, and eſpecially all kinds of eruptive diſeaſes and catarrhous affections ; as influenza, meaſles, ſmall-pox, every ſpecies of angina, petechial fever, and laſtly plague. In winter, the ſame cauſe often occaſions epidemic pleuriſy, or peripneumony of a moſt mortal kind, and always bearing ſome likeneſs to the epidemics of ſummer and autumn.

In this progreſſion or increaſe of the peſtilential principle, thoſe perſons are firſt ſeized, who have the leaſt power of reſiſting its operation. This inability may proceed from various cauſes. It may be occaſioned by the natural organization of the body ; ſome bodies being naturally more ſuſceptible of diſeaſe, than others. This indiſpoſition of bodies to repel the morbid action of air or other cauſes, is hidden from the eyes of man ; but that it exiſts, we have proofs in every days experience.

Other perſons are prediſpoſed to certain diſeaſes by artificial means. Thus every exceſſive ſtimulus, induces indirect debility, a fruitful cauſe of diſeaſes. Hence the liability of robuſt people to all violent fevers.

Others may be expoſed to peſtilential diſeaſes from living in ſituations, where the peſtilential principle is aſſiſted in its operation by the debilitating qualities of morbid exhalations. Hence the early appearance and furious ravages of the plague in the narrow ſtreets of cities, and the filthy apartments of poverty.

From theſe and other cauſes, it happens that ſome perſons are ſeized with peſtilence, long before the bodies of others yield to the action of the deſtructive cauſe. This will rationally account for all the variety of phenomena, which accompany this ferocious malady.

The ſame reaſoning applies to the angina maligna, which is only another form of peſtilence. Fothergill relates, that this diſeaſe appeared in London in a few caſes in 1739, and then diſappeared for a period of two or three years. It did not become epidemic, tho very infectious.

Works, p. 198.

To confirm this hypotheſis, I may remark that the plague is leſs infectious on its firſt appearance. This is admitted by Ruſſel, on the plague of Aleppo, p. 19. 300, 297 and 315. At the ſame time, it is agreed on all hands, to be more mortal, than in its later ſtages. If infection were the cauſe, the reverſe would be true, and the diſeaſe would be more mortal, in proportion to its extenſion, and the accumulation of infectious matter. The firſt caſes alſo would be equally infectious, within the reach of their effluvia.

Skenkius obſerves that many perſons lived in infected houſes, where others were diſeaſed, for three or four weeks, without any ill effects ; but they afterwards ſickened and died. This he aſcribes to an increaſe of infection, and recommends, as the means of prevention, changes of clothes, and liberal uſe of water in the apartments. The fact may be explained on this principle ; or it may be, and moſt probably is, the effect of the ſlow operation of the morbid air in inducing debility on particular ſyſtems. But it goes to prove that the infection of the diſeaſe is not ſpecific contagion, but a vapor or acid, unfriendly to health, that is capable of every imaginable degree of force ; ſlighter degrees of which require a long time to undermine the energies of life.

Another conſideration, which decides againſt the origination of the plague from infection, is, that almoſt all other diſeaſes, whether infectious or not, exhibit the phenomena juſt deſcribed. It is not the plague alone that appears, this year in one town, and the next in a contiguous one ; or this week in one family, and the next in another ; or at the ſame moment, in two families or towns, at ſome miles diſtance. The ſame phenomena characterize dyſentery, meaſles, anginas and other maladies which are infectious ; and even intermittents, remittents, and ſome others, which are not ſpread by infection.

Such was the manner in which the fatal dyſentery of the period about the year 1751, leaping from place to place, in different years, ravaged Connecticut, for three or four years. The ſame took place, with that diſeaſe, from 1773 to 1777. It was ſcattering from place to place, during a ſeries of years, and then almoſt totally diſappeared, for many years. Sometimes it ſpread over a whole town ; at others, it was limited to a particular ſtreet. In ſome inſtances, it ſwept away a large part of a family ; in other inſtances, families entirely eſcaped. The ſame has been its progreſs, during the laſt five or ſix years. In 1794, it ravaged Derby; in 1795, New-Haven. In 1798, it invaded a particular ſtreet in the country, two miles from Stamford, was infectious and mortal, while the town generally eſcaped.

The ſcarlatina from 1793 to 1796, exhibited the ſame facts. Its general progreſs was eaſtward, but it often paſſed by a town and firſt ſeized one beyond it.

The angina maligna in 1735 and 6 was remarked for the ſame manner of appearance. It began in Kingſton, in New-Hampſhire, but inſtead of a regular progreſs, ſtep by ſtep, it ſeized Boſton, fifty miles diſtant, before it did Cheſter, only ſix miles diſtant; yet its general progreſs was weſtward, and hardly any place eſcaped. Both this diſeaſe and the ſcarlatina of the laſt period, reſembled the plague in theſe other reſpects—they were moſt mortal at firſt; and they affected families with very different degrees of violence, ſlightly troubling ſome, and extinguiſhing the lives of all the children in others.

The invaſion of the influenza exhibits ſimilar facts. It ſeizes at firſt only here and there a perſon; afterwards it becomes general, as at Edinburgh in 1762. See Eſſays and Obſ. Edin. vol. 3. At other times, it has ſeized whole towns in a night; nor does it proceed from town to town, according to their order on a map. Yet its *general* courſe is in one direction.

I could produce a multitude of ſimilar inſtances of pleuriſy, and common autumnal fevers not infectious, which appear one year, in one part of the country, and another, in another, without any viſible cauſe for this variety. The inſtances related by Dr. Buel of the town of Sheffield, are very diſtinguiſhed. See my Collection on the Yellow Fever, p. 53 and 60. That town contains two large ponds, which make conſiderable marſhes, that are ſources of remittents. In 1794, remittents of unuſual violence appeared within the miaſmata ariſing from the ſouth pond —in 1795, a ſimilar fever raged in the vicinity of the north pond.

This appeared at firſt an unaccountable phenomenon; but afterwards the fever about the ſouth pond in 1794 was aſcribed to the drawing off the water, and expoſing great quantities of putreſcible ſubſtances to the action of heat. But ſtill the difficulty is not removed. The north pond is admitted to be the moſt uſual and fruitful ſource of diſeaſes; but theſe did not appear, in any extent, in 1794. The queſtion then is, not why the diſeaſes occurred, in that year, about the ſouth pond, but why they did *not* appear about the north pond, the principal focus of ſickneſs in other years, and about which they raged with melancholy effects in the two following years? No alteration is ſuggeſted to have been made in the circumſtances of the north pond; yet in one year, its exhalations were almoſt harmleſs, and in the next, they ſpread deſolation over the neighborhood.

See Medical Repoſitory, vol. 1. p. 458.

In ſuch caſes, juſt reaſoning leads us to ſuppoſe the general ſtate of the air or the local exhalations or both, differ materially in the degrees of their force and activity, in different years; but to human eyes, the cauſe of this difference is not often viſible.

Sometimes a ſevere epidemic will rage in one town and a milder epidemic of a ſimilar type in the vicinity. Thus Zimmerman obſerves, that he has known a violent diarrhea follow a ſuppreſſed perſpiration in September, in one town, when a dyſentery was epidemic in the neighboring country. To what ſhall we impute this difference of diſeaſes, within a few miles, of each other, but to the different force of local cauſes? A general cauſe, as a hot ſeaſon, may prediſpoſe the body to a diſeaſe of a particular type, but this principle may be modified by innumerable circumſtances on the ſurface of the earth.

In analogy with theſe facts, is the manner in which peſtilential diſeaſes invade different ſpecies of animals. In one place, horſes are ſeized; in another, cows; in a third, ſheep. In one year cats fall victims to peſtilence; and the next, hens and geeſe; but infection has no concern in theſe phenomena; and we are to aſcribe them to the various force of the peſtilential principle in different ſeaſons and places.

The phenomenon now under conſideration has not eſcaped the obſervation of other phyſicians in Europe. Stapfer, cited by Zimmerman on Phyſic, relates that the village of Oberwyl, in the Canton of Berne, was attacked with a violent dyſentery in 1749, while the neighboring villages were free from the diſeaſe. In the next year, Oberwyl was healthy, while the neighboring villages were ravaged with the ſame diſorder, tho not ſeparated from the other by any mountain or foreſt. I have occaſion, ſays Zimmerman, to obſerve ſomething like this, almoſt every year.

The Engliſh Editor remarks on theſe facts, that "the dyſentery, like other contagious diſeaſes, is ſpread by communication with the infected perſons and clothes, and *therefore* it is not ſtrange that one village ſhould eſcape, if its inhabitants were careful to avoid communication with their infected neighbors."

Juſt ſo important are all the reaſonings of the infection-ſticklers! The remarks are common-place and do not reach the point of difficulty. The queſtion, is, to know why ſeveral villages eſcaped the diſeaſe, in the year when infection was *near* them, and were ſeized, the next year, when *no* infection exiſted. The winter's cold totally extinguiſhes the infection of that diſeaſe; ſo that the learned Editor is left without a reſource. If any infection had ſurvived the froſt of winter, it muſt have been in the village firſt infected, and in that place common ſenſe and obſervation would teach us to look for a revival of the diſeaſe, the ſucceeding ſpring. But no; that village is in perfect health, and others, where there had been no fomites, are laid waſte by its ravages.—Such are the facts, and no theory of contagion is able to explain the cauſe of their exiſtence, in regard to this or any other diſeaſe.

The dyſentery alſo has, in ſome places, made the diſcrimination, obſerved in the plague; ſeizing perſons of a certain nation or blood, and not affecting others who are equally expoſed. In an epidemic dyſentery in Nimeguen, the French and Jews all eſcaped.

Van Swieten, vol. 16. page 57.

There is a fact related by Hodges and Diemerbroeck reſpecting the plague which muſt not be omitted. Many perſons who had breathed the peſtilential air of London and Nimeguen, went into the country, where they had the benefit of good air. Here they lived in health a month or two, then ſickened and died of the plague. This is attributed to the latent poiſon, which lies long inactive in the ſyſtem, then operates to the deſtruction of life. This may be the cauſe; but is it not more natural to aſcribe the fact to higher excitement from a pure air, on a debilitated ſyſtem, inducing indirect debility? Or ſhall we ſuppoſe that a peſtilential atmoſphere is moſt ſtimulant, and that a removal into a pure air, induces direct debility? Perhaps the following facts will throw ſome light on the ſubject.

In 1789, I left Hartford in October, when the influenza was ſpreading in that town, and was ſeized with the diſeaſe juſt after I arrived at Boſton. A fortnight after, I returned, with two ladies who had lived in Boſton. In a week after my arriving at Hartford, the town of Boſton was attacked with the influenza, and the two ladies at Hartford were ſeized at the ſame time. The concluſion I draw from the fact, is, that the conſtitution of air, producing the epidemic, is ſome time in operation, before its effects are viſible, gradually inducing a diſpoſition in the ſyſtem to that diſeaſe; and as it is progreſſive, it requires about the ſame time to run through its courſe in one place as in another, and is not always interrupted by local cauſes.

But the moſt incontrovertible evidence, that infection is not the primary, controlling cauſe of the plague, ariſes from the manner in which that epidemic ceaſes.

If infection were the principal and ſpecific cauſe of its propagation, it muſt rage forever, or as long as any of the human race ſhould ſurvive to receive it; for the longer the diſeaſe exiſts, the more extenſive muſt it be. This concluſion is inevitable; for if infection ſpreads the diſeaſe ſo rapidly, that one or two diſeaſed perſons diffuſe it in a few weeks over a city, the ſame principle muſt, in a given time, extend it over the whole earth, unleſs its operation ſhould be arreſted by a ſuperior cauſe. And as one diſeaſed perſon is ſuppoſed to infect more than one healthy perſon, its progreſs muſt be accelerated, in a duplicate, triplicate and quadruplicate ratio to its diſtance from its ſource. Its velocity alſo muſt be increaſed, not only by numbers in a crouded city, but by an augmented virulence, until all the inhabitants ſhould be deſtroyed. But all this is contrary to fact.

Moſt plagues are modified and regulated by the ſeaſons; but the ceſſation of peſtilence in different countries, is in different ſeaſons, and ſeems to depend on oppoſite principles. In Egypt, a warm country, never reached by what may be called *cold*, the plague begins in winter, as in December, January or February; after the Nile has ſubſided within its banks, leaving extenſive plains and numerous canals, expoſed to a hot ſun; with a ſlimy ſurface and ſtagnant water in abundance, on the face of the country. During this period alſo blow the ſoutherly and ſuffocating winds, hot and duſty, from ſandy deſarts, which may augment the cauſes of diſeaſe.

On the other hand, the diſeaſe ceaſes in June, when the Nile overflows its banks, ſpreading freſh water over the face of the country; at which time alſo begin to blow the cool refreſhing elyſian breezes from the north or Mediterranean ſea.

Hence it is obvious that the exiſtence of the diſeaſe depends on the general ſtate of the atmoſphere; for the inundation of the Nile certainly does not waſh away the infection from the houſes and clothes of the ſick. On the other hand, the plague ceaſes, when the infection is moſt general, and this is true in every inſtance.

It may be ſaid, that the plague ariſes from putrid exhalations in Egypt, and the reaſon why it ceaſes, on the riſing of the Nile, is, that the expanſion of freſh water over the country and a pure northerly air, deſtroy theſe exhalations.

In this obſervation there is truth; and it would account for the origin and the ceſſation of the plague, if it was an annual diſeaſe, regularly influenced and entirely governed by the ſeaſons. But here again we are overthrown; for in moſt years, putrid exhalations, which always exiſt at a certain ſeaſon, do *not* produce the diſeaſe. Thus we are driven to ſeek another cauſe, which is *not* influenced by ſeaſons; and to ſuppoſe its *co-operation* with hot winds and ſtagnant waters in the generation of the diſeaſe. This is moſt indubitably the fact.

Again, the plague in Syria, farther north, where ſome winter's cold is experienced, begins in ſpring, as in February or March, and ends in June and July, during the moſt exceſſive heat of the ſummer. This is the fact, from Aleppo to Jeruſalem, and has been, from the earlieſt records extant.

Here then different cauſes, extreme heat and drouth, ſeem to control the rage of the plague. But does heat deſtroy infection? Never, unleſs by combuſtion. No degree of heat that is ever felt in the tropical regions, or in America, has ever mitigated the force of infection, but always has increaſed it. Now we know, that the heat of Syria, never exceeds in degree what is annually experienced in the Weſt-Indies and the United States, to the 42d degree of latitude certainly, and probably to the 44th. In one reſpect Syria differs from this country ; the ſummers are longer than in the northern ſtates of America, and the climate ſubject to drouth. But it cannot be the duration of the heat which deſtroys the plague ; for that diſeaſe ceaſes at the very beginning of ſummer. It abates in June, and rarely appears, to any extent, as late as Auguſt. Nor can we concieve why drouth in Syria ſhould put an end to the epidemic, for in moſt *other* countries, it has not that effect. In Europe and America, extreme drouth has very often inflamed its violence.

In this inſtance then we find no cauſe for the ceſſation of the plague, in the weather or ſeaſons, which we are able to comprehend. We know the uniformity of the fact ; and all beyond this, is conjecture. Infection can have no concern in the effect ; unleſs on ſome principle hitherto unknown, cool weather generates it and heat deſtroys it, contrary to facts in all other countries.

Certain it is, that the plague at Aleppo, Damaſcus, Said, Jeruſalem, Latakia, and on all the Syrian coaſt, ceaſes in extreme hot weather, and when the infection is in its utmoſt extent and violence.

In Italy, Conſtantinople, in all Europe and the temperate latitudes of America, ordinary plagues yield to cold ; that is, they ceaſe as epidemics of that form ; but the general cauſe never fails to ſhow its influence, in giving to the diſorders of winter, ſome of the general ſymptoms which characterize the epidemic of the ſummer. This proves that, in common peſtilence, morbid exhalations *aid* the atmoſpheric cauſe in producing the epidemic ; and that it is not ſpecific contagion which contributes to ſpread the diſeaſe, for this is not influenced by cold ; but it is morbid exhalations, that yield to cold. Hence, in northern climates, cold ſuſpends the action of the two ſubordinate cauſes of peſtilence, morbid exhalations and infection ; and this is uſually ſufficient to check the epidemic.

But that the great primary cauſe, is not affected or rather ſubdued by cold, is apparent from theſe facts ; that altho the plague, in its peculiar autumnal form, is ſuſpended, yet the diſeaſes of winter, as pleuriſy and peripneumony, wear the ſame character ; which can be occaſioned only by the continued action of the ſame cauſe. Further, ſome plagues have not yielded to cold, as I have before obſerved. Several inſtances have occurred, in which the diſeaſe has run through all the ſeaſons without interruption or abatement. This fact demonſtrates that the primary cauſe, exiſting in the eſſential properties of the elements, may be of various degrees of force, and at times does actually ariſe to a degree, capable of producing and continuing that diſorder, not only without the aid of morbid exhalations and infection, but in defiance of cold.

In conformity with this idea, is the fact that a peſtilence which begins the earlieſt in the ſeaſon, is the moſt mortal. This is agreed by P. Alpinus, Van Swieten and Sydenham, " Minus ſæva eſt, quo tardius illuc acceſſit, viderique incepit ; ita ut quo tardius venerit, eó mitior ac brevior ſit judicanda," ſays Alpinus, Rerum Egypt, Vol. 3. 70. The reaſon of which is, that in proportion to the ſtrength of the elemental cauſe, it begins to exhibit its effects early in the ſeaſon ; that is, with the *leaſt aid* from heat, noxious effluvia or other local cauſes.—If the general contagion of the atmoſphere is very powerful, its effects may appear even in winter, in oppoſition to cold ; hence the juſtneſs of Diemerbroeck's remark, that peſtilence beginning in winter, is the moſt fatal. If, on the contrary, the general conſtitution of the air is leſs hoſtile to life and health, it will not produce an epidemic peſtilence, till it is aſſiſted by great heat and local vitiation of the air ; therefore the diſeaſe will not appear, till late in the ſeaſon.

Something like this, on a ſmall ſcale, has characterized the different epidemics in Philadelphia. In 1793, the precurſors of the epidemic were light, and the firſt caſes did not appear, till the laſt of July or beginning of Auguſt. In 1797 and 98, the firſt caſes occurred in June, and the diſeaſe in the latter years, was marked with by far the moſt malignant ſymptoms, altho the timely evacuation of the city prevented bills of mortality equal to that of 1793.

In New-York, this circumſtance, it is believed, has been leſs noticeable; but it may be remarked, that in the years of the epidemic, the firſt caſes occurred in the laſt week in July, and in years, when a few ſporadic caſes* only have appeared, they have not occurred till many weeks later. Beſides, it is very obvious that the diſeaſes of 1795 and 6, if not of 1797, were powerfully influenced, in their commencement, by local cauſes; as great maſſes of putrid matter, in the parts of the city, where the firſt caſes occurred, and where the epidemic exhauſted its principal force.—

In general, it may be obſerved in our climate, that if a malignant fever does not appear, in a city, till late in Auguſt, the citizens need not apprehend very general deſolation. If caſes occur early, as in June, there is ſerious ground for apprehenſions of danger. The only exception to theſe remarks, is, when the ſeaſons ſuffer ſome great, unuſual and ſudden viciſſitudes, which, during a peſtilential period, may overwhelm a city with almoſt inſtantaneous calamity.—Such may be a ſudden invaſion of heat in Auguſt, after preceding cool weather.

In general it is a juſt remark, that as the force of the peſtilential principle, is of various degrees, in different periods, ſo when it is moſt powerful, it attacks men the earlieſt in the proper ſeaſon, and is deſtined to be the moſt deſtructive.

The preceding facts and concluſions ſeem ſufficient to eſtabliſh the great point, that neither contagion nor infection has ever had much influence in originating or propagating peſtilential epidemic diſeaſes of the autumnal kind.

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* The advocates of the ſpecific contagion of the plague do not admit that the true plague ever appears in ſporadic caſes. They think, if it once appears, its contagion muſt of neceſſity, ſpread it. This is all a whim. I believe, with Dr. Mitchell, that any diſeaſe of the worſt type, may be generated in the body, ſolely by a derangement of the functions of the ſtomach and inteſtines, and the poiſonous air extricated from food. But that ſporadic caſes of plague may occur and do occur very often, I have not the leaſt doubt. During the late war, in 1776 or 1777, two brothers by the name of —— arrived from the army at Greenwich in Connecticut—one had a malignant fever, with glandular tumors; the other was his nurſe and in good health. The ſick man died ſoon after he arrived, and in leſs than 24 hours, his brother was alſo in his grave. This was true plague; but no other attendant was infected.—

But objections remain to be anſwered. It is alleged that the plague begins in maratime places and thence ſpreads into the country adjacent. Thus it is aſſerted by the college of phyſicians in Philadelphia, that the peſtilential fever in America "commences invariably in our ſea-ports, while inland towns, equally expoſed to the ordinary cauſes of fever, eſcape." Memorial, dated Dec. 5, 1797.

Pliny, a great obſerver of facts in the natural world, goes farther and aſſerts, "That peſtilence is obſerved always to proceed from ſouthern regions towards the ſitting ſun; nor does it ſcarcely ever happen otherwiſe, except in winter."

Lib. 7. Cap. 50.

Mead and the author of Traité de la peſte have cited this opinion with approbation. By the words of Pliny "a meridionis partibus, ad occaſum ſolis," muſt mean from Egypt and the Barbary coaſt, towards Italy, Gaul and the other weſtern parts of Europe.

From theſe facts, is inferred a ſtrong argument in favor of the propagation of that diſeaſe by contagion.

With deference to theſe great authorities, not one of theſe aſſertions is accurate. That the plague generally appears firſt in ſea-ports, is a juſt remark, and according to the laws of nature, it muſt be ſo, without infection. But to this rule there are many exceptions. The general plague in the days of Thucydides originated in Ethiopia, near the borders of upper Egypt, *not a ſea-port.* The violent plague in 252 began in the ſame region; as did that of 1736.

The plague of 542 began in Lower Egypt, between Peluſium and a moraſs, called the Serbonian bog, at a diſtance from the port of Peluſium. It ſhould have been mentioned that the mortal plague in the reign of the Antonines began in Seleucia, on the Tigris, far from the ſea. The black peſtilence of 1348 originated in China. That of 1450 in ſome parts of Aſia. The peſtilence of 1348 began, when it firſt appeared in France, in Avignon, *not* a ſea-port; as did that of 1482. The plague of 1575 in Italy, began at the northward, in Trent, and proceeded ſouthward, contrary to the aſſertion of Pliny; and every one sknow Trent is not a maritime place. The plague in Holland in 1663, began in Heuſden, *not* a ſea-port, but on a river and near a moraſs. In 1702, a plague broke out in Poland, far from the ſea.

With reſpect to the United States, the aſſertion of the College of Phyſicians muſt ſtand or fall, according to the definition of the fevers which have appeared in the country. If no peſtilence has ever appeared, except in ſea-ports, we muſt affix ſome other name to the mortal epidemics that viſit the interior of our country. Certain it is, contrary to the ſtatement of the College of Phyſicians, that the true yellow fever, and ſo called at the time, prevailed in Albany in 1746.

About the marſhes in the interior of our country, an epidemic bilious fever has times without number, raged as fatally, as ever it did in Philadelphia, deſtroying life in three or four days, attended with all the characteriſtic ſymptoms of yellow fever and carrying off almoſt every perſon, within the region of its atmoſphere. This has happened, about ſome of the lakes in the ſtate of New-York, every year ſince the preſent peſtilential period commenced, and whole villages have been depopulated. If the College of Phyſicians chooſe not to call this diſeaſe yellow fever, I cannot help it ; but ſure I am, if it is not that ſpecific diſorder, it is one equally deſolating, and as little entitled to be fathered on the country, as any ſpecies of plague whatever. It is a fact alſo that the bodies of thoſe who periſh by that fever near rivers and lakes, are, if poſſible, more yellow than in cities.

But what utterly diſproves the aſſertion of the College of Phyſicians, is, that the ſame peſtilential diſtemper which has lately afflicted our cities, appeared among the aborigines of this country, before it was ſettled by the Engliſh, before the Weſt-Indies were ſettled by the Engliſh or French, and before a ſingle veſſel from the iſlands had ever reached our ſhores. To confirm this fact, it is well known that the ſame diſeaſe has often viſited them, ſince the Engliſh ſettlements, and in ſituations and under circumſtances, when it was not poſſible for them to receive it from infection, as at Nantucket and Martha's Vineyard in 1763, and ſeveral times, in the limits of the preſent ſtate of Rhode-Iſland.

The Onandagoes in the ſtate of New-York, three or four hundred miles from a ſea-port, about eighty years ago, were attacked with peſtilence, which waſted the tribe ; and the place where their village was then built, has, on the account of that mortality, been ever ſince abandoned, and is now overgrown with trees. The ſame happened among the Senecas at a later period.

What the diſeaſe among the Onondagoes was, I am not informed ; it might have been the ſmall-pox ; but the country where it happened, is now ſubject to mortal bilious epidemics, which kill in three days, and turn the body as yellow as ſaffron. Beſides the great plague of 1618 is known to have been the true infectious yellow fever, and ſo was the fever of Nantucket in 1763, neither of which could poſſibly have been imported.

About ſixty years ago, a great mortality happened among the Indians, on the north eaſt of a ſmall ſtream, a little ſouth of Eaſt-Greenwich, in the ſtate of Rhode-Iſland. The diſeaſe was fatal to almoſt all who were affected ; but it was local, and infectious, for a law was paſſed that no perſon ſhould go from one ſide of the river to the other, and the Indians on the oppoſite ſide remained in health. This place was no ſea-port, but an Indian hamlet ; and no pretence of importation is ſuggeſted, nor does it appear, that any whites were affected.

About twenty-ſix years ago, a malignant bilious fever attacked the Indians, at Quidneſit neck, in North-Kingſton, in the ſame ſtate, and moſt who were ſeized, periſhed. It attacked alſo a few families of whites, but with leſs mortality. North-Kingſton is a ſea-port, but there is no ſuggeſtion of foreign origin.

M. S. of Moſes Brown of Providence.

From theſe facts let the public judge how little reliance can be placed on general aſſertions even of learned and reſpectable ſocieties, when made without a critical examination of the ſubject.

It is proper that I ſhould here take notice of an aſſertion, found in a number of authors. "That Thucydides relates the plague, in his days, to have ſpread from Ethiopia by means of contagion, infection or fomites." The learned Diemerbroeck has fallen into this miſtake. p. 48.

Galen is more correct, when he ſays, that peſtilence ſpread by the corruption or infection of the air. This idea, tho not the expeſſion, is accurate. The truth is, Thucydides does not ſay, the diſtemper ſpread by infection or contagion. A literal tranſlation from the Greek is as follows. "It began as it is reported, firſt from Ethiopia, above Egypt; then it fell on Egypt and Lybia, and a great part of the King's dominions (Perſia.) It then ſuddenly invaded the city of Athens and firſt the Pieræus." In the paragraph preceding he ſays, the diſeaſe had prevailed in many regions firſt and eſpecially at Lemnos; but does not hint at infection or contagion as the cauſe.

The obſervation of Pliny, that peſtilence originates in ſouthern climates and proceeds northward and weſtward, is generally, but not always true. Alexander Ruſſel tells us, the peſtilence in Aleppo in 1719 came from the northward; and many authors relate that it appears in Conſtantinople or Smyrna, before it does in Egypt. This may be partly owing to alterations in the Turkiſh cities, ſince Pliny's time.

But on juſt principles, the fact is rationally explained. If a particular ſtate of air, favorable to the propagation of that diſtemper, muſt exiſt, before it can become epidemic, which is admitted by the friends and foes of contagion, then ſuppoſing this *general* peſtilential principle to exiſt, at a given time, in equal force, all over the earth, or any portion of it; it muſt follow inevitably, that this general cauſe will produce the worſt diſeaſes *firſt* in climates and ſituations, where the moſt powerful *local* cauſes exiſt, as heat, moiſture, and all kinds of deleterious exhalations. And for a moſt obvious reaſon; the debility of the human body muſt be firſt induced in thoſe ſituations.

This is a complete ſolution of the fact mentioned by Pliny; and he himſelf juſtifies this explanation of it, for he excepts from his own general rule, the peſtilence that appears in winter, a circumſtance paſſed over by Mead. Now the reaſon why a plague beginning in winter does not follow the courſe of one beginning in ſummer, but appears ſometimes in northern climates *firſt*, is, that ſuch a peſtilence does not require the aid of contingent cauſes, as noxious exhalations. It is independent of *local cauſes*, and induced ſolely by the eſſential qualities of the atmoſphere; it may therefore appear firſt in any place or climate whatever, according to that ſtate of air. This happens only in great plagues which ſeldom occur.

Theſe obſervations apply alſo to the objection that peſtilence firſt appears in maritime places, as mentioned by Procopius, and others.

It is a fact known to every medical man that humidity is a cauſe of debility. Hear what the learned Zimmerman ſays on this point.

On Phyſic, vol. 2. p. 100.

" The humidity of air weakens a man ſuddenly; it relaxes the ſolids, and of courſe weakens the circulation, ſo that the ſecretions are carried on with difficulty. The inſenſible perſpiration is checked, the moiſture paſſes in through the abſorbing pores of the ſkin, and the patient feels a laſſitude and heavineſs, which deprive him of all his gaiety, and render the mind as oppreſſed as the body"—" Damp ſituations are, in every country, unhealthy."

p. 102.

There is not a perſon living who cannot teſtify to the truth of theſe remarks. Hence the languor which depreſſes man, in a hot ſultry day, with a ſoutherly light air, *loaded with vapor*. Hence this ſtate of the air, when of long continuance, never fails to generate epidemic diſorders; and if it occurs, during a peſtilential conſtitution, mankind ſeldom eſcape the ravages of the plague.

It may be ſaid that the inhabitants of maritime towns, are leſs expoſed to this ſcurce of debility, than ſeamen, who are in general remarkably healthy. To which I anſwer, that the ordinary moiſture from ſea air never of itſelf produces diſeaſes; and at ſea, there exiſts no exciting cauſe, as morbid exhalations, unleſs in ſhips of war and crouded tranſports, in which diſeaſes often proceed from human effluvia. But I queſtion whether the bodies of ſeamen poſſeſs the ſame firm texture as thoſe of laboring farmers in the country. Certain it is, that ſeamen are in general not ſo long-lived men, as farmers. This is aſcribed to their irregular and ſevere fatigue; but I ſuſpect it more owing to the inceſſant operation of the debilitating powers of moiſture.

Whatever may be in this, it is certain that moiſture of *itſelf* induces debility, in a greater or leſs degree, tho not diſeaſe ; but when its action on the ſyſtem is combined with the operation of morbid exhalations, which abound in cities, eſpecially near navigable water, together with the frequent alternations of heat and cold, occaſioned by the contiguity of land and water ; we are not to be ſurpriſed that cities on the borders of the ocean, and the banks of rivers, are the firſt to be attacked with peſtilence. We might, without the aid of facts, prove a priori, that this muſt generally be the caſe.

Hodges mentions that the London plague of 1665 ſpread into the adjacent country, *eſpecially along the Thames ;* but he takes care to aſcribe this to infected goods, and not to humidity—another proof of the miſchiefs of theory.

Indeed the circumſtance that next to large maritime cities, the towns ſituated on the borders of rivers or lakes, are the moſt ſeverely harraſſed with epidemics of a fatal kind, eſpecially autumnal diſeaſes, is an evidence of the truth of the ſame principle. Wherever we turn our eyes, we ſee autumnal diſeaſes, from ſimple tertians to the plague, moſt frequent and moſt deadly, in low ſituations, under the combined operation of heat, moiſture and different ſpecies of noxious exhalations. It is therefore as unphiloſophical to deduce, from this fact, arguments in favor of the foreign origin of the plague, as in favor of the importation of many other malignant diſeaſes ; for the ſame phenomena attend them all—they all appear *firſt,* and are moſt epidemic and fatal, in the vicinity of water. This is their general rule, to which exiſt ſome exceptions, as well in regard to the plague, as to other bilious complaints.

But the diſcovery of a general peſtilential principle, extending over a whole hemiſphere, or the whole globe nearly at the ſame time, or with a rapid progreſſion, ſolves all the difficulties on this ſubject. Had Pliny known, that at the moment a ſevere plague appears in Egypt, the diſeaſes of all Europe, or all the world, aſſume unuſual malignancy, or other contagious and infectious epidemics appear, in every quarter, to the diſtance of a thouſand leagues, his remark would have been equally juſt, as to the origin and progreſs of the plague, but it would have opened to him new cauſes of its origin, and a more juſt and philoſophical view of the phenomenon. This is a diſcovery which proſtrates all theories of ſpecific *contagion*, and reduces the influence of *infection* to its juſt meaſure.

Another fact. Foreſtus has declared that in peſtilence, three times the number died in wet weather, as in fair and dry weather; the infection being leſs eaſily diſperſed, in wet weather, which is evident from the ſmoke of chimnies.

Van Swieten, vol. 16. 26.

It is well known in America, that while the weather is hot, rains and moiſt air greatly multiply caſes of peſtilential fever.

In 1720 a ſtorm of thunder and lightning at Marſeilles, late in July, was followed by a great increaſe of the plague.

Traité de la peſte.

Every one knows that the air, along the borders of the ocean, corrodes iron and other metallic ſubſtances. Is it not then queſtionable whether the ſaline acid, which impregnates the maritime air, has not ſome deleterious effect on the human body, when combined with other vapors from the earth? Are we yet acquainted with the eſſential properties of all the poſſible combinations of aerial ſubſtances?

Again; Mead has remarked, that countries and cities which have had moſt commerce with Africa, as Marſeilles, have been moſt frequently afflicted with the plague. A French author, he ſays, reckons 20 plagues that have infeſted Marſeilles, notwithſtanding its healthy ſituation.

In oppoſition to this, it may be proved by facts, that the cities, in the interior of Germany, that never had any trade or connection with Egypt, uſed formerly to be harraſſed with that diſeaſe, nearly, if not quite as often as the maritime ports of England, France, Spain or Italy. Any man will learn this, who reads the *whole* hiſtory of that calamity, inſtead of that of a few detached inſtances.

As to the twenty plagues of Marſeilles, aſcribed to the trade with Egypt, I would obſerve, that I can produce the hiſtory of near double that number of violent plagues in London, *before* that city had any trade or connection with Egypt.

Equally ill founded is the idea of medical writers that the yellow fever of the Weſt-Indies was brought firſt from Siam. "Maladie de Siam," is the name given to it by French phyſicians; and this improper name, will ſerve to perpetuate the error, while it ſhall exiſt as a monument of ignorance and falſe philoſophy. This pretended Siam fever was the peſtilence of the Indians, on this continent, before the Weſt-India Iſlands were ſettled by the French or Engliſh.

Another extraordinary aſſertion of Mead, is, that "the northern nations of Europe, before their connection with Africa in trade, grew populous more rapidly, than in modern times."

I will not conteſt the aſſertion, as it regards the degree of population of thoſe countries, in different periods. Authors differ in opinion on the ſubject of the ancient population of Europe, and no certain documents or facts exiſt by which the point can be aſcertained.

But the implication neceſſarily deduced from Mead's aſſertion, is, that the plague is more frequent and deſtructive in the north of Europe, ſince a trade has been opened with Egypt, than before; for on this principle only would he account for the reduced population of modern times. If this is what he meant to inſinuate, the aſſertion is not ſimply inaccurate, but abſolutely falſe. From the firſt accounts we have of Ruſſia, Poland and the Baltic regions, to the firſt opening of a trade with Egypt, in modern days, plagues were much *more frequent* and fatal in thoſe countries than they have been, within the laſt century, ſince a conſtant trade has been carried on with Egypt and every part of the Levant. For the truth of this aſſertion, I appeal to facts.—In the year 1485, the Engliſh firſt opened a trade to the Mediterranean, eſpecially with Italy, and a conſul was appointed, reſident at Piſa. The act of appointment by Richard 3d. contains this paſſage "whereas certain merchants and others, from England, *intend* to frequent foreign parts, and chiefly Italy, with their ſhips and merchandize"—Before this, England had little or no trade, *directly* with foreign countries. All her trade was conducted by Lombards, Genoeſe, Venetians and the Hanſe merchants. There was no direct trade to Egypt and the Levant.

About the year 1511, Engliſh ſhips began to frequent Sicily, Candia, Chios and the Syrian coaſt; but this was accounted a very hazardous voyage, and ſhips ſeldom made it in leſs than a year.

In 1535 Engliſh factors firſt ſettled in thoſe countries.

See Anderſon's Commerce, vol. 1. 683. vol. 2. 79.
Rymer's Federa, vol. 12. 261, and Hackluits Voyages, vol. 2. 96.

Now, the fact is, that the plague was as frequent and ſevere in England, Denmark, Sweden and Germany, in the tenth, eleventh, twelfth and thirteenth centuries, before any foreign trade exiſted, as in any later period. Not to mention the univerſal plague in the days of Vortigern, about 448, which never has been exceeded in extent and violence, unleſs by the black peſtilence of 1348.

The Levant Company was firſt eſtabliſhed by Queen Elizabeth in 1581, and the act of incorporation expreſsly ſtates that "Sir Edward Oſborn and his aſſociates, the perſons incorporated, had at their own great coſts and charges, *found out and opened* a trade to Turkey." Before that time the commodities of Egypt, Syria and Turkey were all imported from Italy, in Venetian or Genoeſe ſhips.

The commerce of the North of Europe from the year 1200 to 1500, was almoſt wholly in the hands of the Hanſeatic Confederacy ; but on careful inveſtigation, I cannot find the leaſt trace of a direct trade to the Levant, by the towns in that league. Indeed before the diſcovery of the mariner's compaſs, in the 14th century, all trade was carried on by coaſting. Hiſtory records more than one hundred general plagues before that diſcovery. So totally falſe is the aſſertion of Mead.

But ſay the College of Phyſicians, in the memorial before cited, " proper health laws, ſtrictly enforced, have latterly protected the commercial parts of Europe from its ravages." This is a point of importance, and while the aſſertion ſtands unſupported by proofs, I am at liberty to deny the truth of it, and there leave the queſtion, as fair on one ſide as the other ; for I cannot prove a negative. If however health laws have produced the effect alleged, it is very ſtrange that the plague did not diſappear at a much earlier period.

The inſtitution of health laws was as early as 1484, and it appears they were firſt introduced at Venice. If theſe laws have ever prevented an epidemic plague, it is very ſtrange, that they were ineffectual in Venice and other parts of Italy, for near two hundred years, as they certainly were. It is indeed wonderful that, during the 16th century when all Europe was almoſt continually ravaged by that diſeaſe, and down to the cloſe of the laſt century, no man could be found to deviſe a law, and no police, to enforce it, ſo as to arreſt the progreſs of the plague in Italy. Yet ſuch was the fact.

The firſt ſtatute, I believe, in England to reſtrain the progreſs of infection, was in 1604, in the firſt ſeſſion of James I. 31. The regulations attempted by the proclamation of Queen Elizabeth in 1580, before recited, prohibiting the enlargement of London, and the reſidence of more families than one in the ſame houſe, could not, from the tenor of them, be carried into effect. The ſtatute of James limits its proviſions to the confinement of the ſick to their houſes, a breach of which was made felony. An enforcement was attempted in the ſubſequent plagues, and eſpecially in 1665, but without the leaſt good effect, as to the city at large, and with a very ill effect upon the diſeaſed and their families. It is certain however that a ſtrict execution of ſuch a law, would arreſt the progreſs of *infection*, for the infection of the plague is found and admitted on all hands to be confined to contact or very near approach, ſo as to be received by the breath of the diſeaſed. If therefore the diſeaſe were propagated by infection only, ſuch confinement of the ſick would check its progreſs, if not annihilate it. We know by repeated experience in America, that there is not the leaſt difficulty in putting an end to a diſeaſe ariſing ſolely from ſpecific contagion; and it has often been done in caſes of the ſmall-pox. Hence the inefficacy of the law of James I. after repeated trials in the plague, is a ſtrong evidence that its propagation depends on ſome other cauſe than infection.

From 1604, to the reign of Queen Anne, no general laws were enacted on this ſubject, as far as I can diſcover from the printed ſtatutes. In the 9th year of Queen Anne, 1709, paſſed the firſt ſtatute enjoining veſſels to perform quarantine; at leaſt I can find none earlier. This was repeated by 26th.

George 2, 1752, a new ſtatute on the ſubject, which was afterwards amended by the 29th of the ſame reign. Now it ſo happens, that the plague ceaſed in London in 1666, forty-three years *before* a general quarantine was inſtituted. Particular laws had been paſſed before, on emergencies, as in 1664, when all importation of goods from Holland, was prohibited, on account of the plague, then in Holland ; but without effect. The truth then, is, ſo far as regards Great-Britain, now the moſt commercial country on earth, and at the time in queſtion, the moſt commercial, next to Holland, the plague entirely ceaſed and diſappeared, 43 years before the exiſtence of quarantine laws. If any miſtake occurs in this ſtatement, it muſt proceed from want of materials—my enquiries are limited to Blackſtone and the printed ſtatutes at large, the only documents I poſſeſs on that ſubject.

In the courſe of my reading, I have found but two or three inſtances, in which it has ever been *ſuppoſed* that health laws have preſerved a city from peſtilence. Mead mentions two inſtances ; one at Ferrara in 1630, where every perſon, ſeized with the diſorder, was immediately removed to a Lazaretto ; which being done in ſeven or eight inſtances, the diſeaſe was checked and diſappeared.

Another inſtance he mentions was at Rome in 1657, where the perſons firſt ſeized were removed to Lazarettos and their families to hoſpitals without the city, and the city was ſoon freed from the diſorder. He ſuppoſes further that the diſeaſe was ſuſpended a whole fortnight in Marſeilles, in 1720, by the ſame means.

I have no account before me of the origin and progreſs of the plague, in Italy, 1630 and 1657, except the ſketches found in Mead's works, but wherever I can obtain a correct account of this diſeaſe, mentioned alſo by Mead, I find his ſtatements are imperfect and erroneous ; I therefore place very little dependence on them. That the plague in Marſeilles was ſtopped a fortnight by regulations of policy, is not true. The diſeaſe appeared in the preceding autumn, and was ſuſpended five or ſix months by the winter. When it appeared in the month of May 1720, witers ſay, the firſt caſes were among thoſe who had intercourſe with the ſhip and goods from Said; but all thoſe goods were prohibited to be carried into the city, and ſubjected to fifteen days retreat and purification. The porters who had concern with them were confined. Some weeks after, in the month of June, caſes of the diſeaſe appeared in the city; all precautions had proved fruitleſs; as the hot weather came on, the diſeaſe ſtarted up here and there in the city, among perſons who never had any concern with the ſhip or the goods, or the infected; it then ſubſided; then again appeared, in the manner before related.

Whether the perſons ſeized in May contracted the diſeaſe from the goods or foul air of the ſhip, or not, is not material; for the goods were cleanſed, and all the diſeaſed confined to the hoſpital, and all the porters ſhut out from the city. Yet when the diſeaſe appeared in the city, no perſon could tell how it came there; many were ſeized who had never been near infection; and hence the populace reſort to ſuppoſition to account for its origin—they *ſuppoſe* the diſeaſe had come from the goods after they were cleanſed, tho they had no evidence of it. Beſides I have before remarked under the year 1720, that the goods could not be infected, for it is admitted on all hands that they were ſhipped at Said, when the diſeaſe was *not* in that port. The ſhip's hold might have generated foul air on her paſſage, and the firſt perſons connected with her might have contracted a peſtilence from that air, which is not an uncommon thing, in ſuch a very ſickly period, as that was, when mortality was increaſed all over Europe and America. But the truth is, had that air been the cauſe of the plague in the city, the diſeaſe would not have been ſuſpended for ſix weeks, but would have made a regular progreſs from one patient to another. But no; it diſappears for ſix weeks, and then breaks out in parts of the city remote from the ſuppoſed ſource of infection, and among people who had not been near that ſource. So inaccurate and inconſiſtent appear all accounts of the contraction of epidemic diſeaſes from fomites, which I have been able to inveſtigate by full and authentic documents. This ſhows how little reliance we can place on partial ſtatements, made to ſupport favorite ſyſtems. I therefore am perſuaded that the caſes mentioned by Mead of the effectual reſtraint of the plague in Italy by removing the ſick, are not fully ſtated, and that an accurate enquiry would prove the ſuppoſed effect to reſult from other cauſes.

The following facts will furniſh a more rational ſolution of the phenomenon.

In the United States, ever ſince the commencement of the preſent conſtitution of air, that is, from 1790, ſporadic caſes of our peſtilential fever have occurred, not only in cities, but in various parts of the country, more or leſs, every ſummer and autumn. In 1792 occurred a number in New-York ; alſo in 1794 when one caſe exhibited infection ; and in 1797. Of about thirty caſes perhaps, in each year, ſome of them were exceſſively violent, highly marked, and in a degree, infectious. In 1791 and in 1796, ſeveral hundred caſes appeared, yet the diſeaſe was not epidemic, but local, and the buſineſs of the city was not ſuſpended. Now had every perſon, the moment of his ſeizure, been conveyed out of the city to a hoſpital, the eſcape of the city, in each of theſe years, would vulgarly have been aſcribed to that circumſtance. This was doubtleſs the caſe in Ferrara and Rome, and this is unqueſtionably the ſolution of the fact, that the caſes in the Italian cities, were ſporadic caſes, which always occur in the neighborhood of the plague. This diſeaſe, in the years mentioned, raged in other parts of Italy ; the caſes mentioned by Mead were ſporadic caſes, indicating a peſtilential conſtitution of air, extending to thoſe cities, but of a leſs malignancy, and too mild to produce a general peſtilence in thoſe places ; it affected only a few perſons of habits moſt ſuſceptible of it ; and to theſe it probably would have been limited, had none of them been removed.

A ſimilar fact occurred in Philadelphia in 1794. Eighty or a hundred perſons died that year of the true yellow fever ; none of them were removed ; but to theſe was limited the operation of the peſtilential principles, local and general ; and no epidemic enſued.

In New-London a caſe occurred in 1795 ; and in 1796 ſeveral caſes of the ſame diſeaſe ; but no epidemic, altho no removal of the ſick took place.

In Providence, ſporadic caſes have occurred almoſt every year, with ſymptoms of the infectious yellow fever. In 1791, in June, died two daughters of a widow, in the center of the town. They vomited bilious matter, and their bodies were yellow, with livid and purple ſpots. Other caſes occurred the ſame year; one caſe in 1792, and a number in 1793, 4 and 5; caſes which could not poſſibly have originated from foreign ſources. Some of them appeared to be infectious, as that of the young women firſt mentioned, the firſt being taken on the 4th of June and dying on the 7th; the ſecond being ſeized on the 9th, and dying on the twelfth. Yet no epidemic followed; and had theſe patients been removed to a diſtant hoſpital, the ſafety of the town would have been aſcribed to that removal, and the ſalutary effect of health laws would, by Mead's followers, have been trumpeted over the country, and what is worſe, would have been recorded as an important fact, which would hereafter miſlead poſterity.

Nothing is more dangerous than to build a theory, or to eſtabliſh a general principle on a few detached facts, inaccurately ſtated, and ill-underſtood.

With regard to the caſe of Rome ſtated by Mead, it muſt be obſerved, that the diſeaſe had, in the preceding year, killed 10,000 of its inhabitants, and in the kingdom of Naples 400,000. The diſeaſe had probably finiſhed its courſe in that region, and the few caſes in Rome in 1657, were only detached inſtances, the remains of the peſtilential cauſe; ſuch as occurred in London in 1666, after the fatal plague of the preceding year. It is by no means probable that the diſeaſe, if neglected, would have become epidemic.

But we have ſtronger ground to oppoſe the idea of the College of Phyſicians, relative to the effect of health laws. Numerous examples are on record, in which the full force of the beſt regulations to prevent peſtilence, has been applied in vain; and ſince the publication of the memorial of the College, from which this idea is taken, Philadelphia has witneſſed the futility of ſuch regulations, in two melancholy inſtances.

In 1636, the law to prevent infection was rigorouſly executed in London; the ſick were confined, ſuſpected families were ſequeſtered; but all to no purpoſe; the diſeaſe ſpread, the legal reſtrictions were then taken off, and no ill effect followed; the diſtemper ſpread no faſter than before.

In 1665, the ſame regulations were tried in vain; and ſo was the law, prohibiting the importation of goods from Holland.

The approach of peſtilence towards Dantzick in 1708, in which year it appeared at Thorn, alarmed the magiſtrates of the former city, and every poſſible precaution was uſed to prevent its reaching Dantzick. Commerce and communication with infected and ſuſpected places were forbidden; no ſorts of merchandize, eſpecially thoſe which are moſt apt to retain infection, were permitted to enter the city from ſuch infected places; all ſtrangers and travellers were ſtrictly examined, and none ſuffered to enter the city, without ſufficient proof of coming from healthy places; all the inhabitants were cautioned not to hold correſpondence with infected places, nor to harbor thoſe who came from them. Theſe and other regulations were enjoined by an edict in July 1708. Yet all to no purpoſe; the plague appeared at Dantzick, the next ſpring.

Baddam's Memoirs, vol. 6. p. 6.

This is a remarkable inſtance of the futility of human regulations, when oppoſed to the laws of the phyſical world. The people of Dantzick, had they been acquainted with the principles of peſtilence, might have foreſeen in 1708, the probability of the inefficacy of their regulations. The ſtate of the air in the production of millions of ſpiders, and the increaſing mortality in the city, indicated the exiſtence of a ſtate of the air, unfriendly to health, which was increaſing and only required a little more virulence to generate the evil, which they ignorantly ſuppoſed muſt come in ſick bodies, goods or old clothes; and which they were idly combatting on that miſtaken principle.

It has already been ſtated that the rigorous execution of health laws at Marſeilles in 1720, proved utterly fruitleſs.

The plague which deſolated Naples in 1656 was ſaid to be introduced into that city by ſoldiers from Sardinia, where it raged the preceding year. Yet the Viceroy, Count Caſtrillo had prohibited all intercourſe with Sardinia. After the diſeaſe appeared which was firſt in the form of a malignant fever, without glandular tumors, all poſſible means were uſed to prevent its ſpreading, but to no purpoſe.

The confidence in modern health laws, is like the reſpect which the ancient Egyptians paid to the bird, Ibis, which, they ſuppoſed, averted the plague by deſtroying the flying ſerpents that the hot Lybian winds brought into the country.

Cicero de Nat. Deor. lib. 1. 36.

The Egyptians were like all modern nations—unwilling to believe the plague generated at home—they aſcribed it to infection brought by flying ſerpents, as the moderns aſcribe it to old clothes, bales of goods and infected ſhips. They miſtook the cauſe, adored Ibis, as the moderns do, quarantine, and with the ſame ill ſucceſs.

But we need not ſtep off of our own territories to find evidence of the inefficacy of health laws, when oppoſed to the operation of the laws of nature. No expedient has been left untried to ward off the calamity of peſtilence, but without any viſible effect. The ſeverity of the affliction in Philadelphia, in former years, had rendered the magiſtracy of the city extremely careful to guard againſt importation in 1798. The moſt rigid quarantine was exacted—ventilators of the beſt conſtruction employed—the veſſels were waſhed, fumigated, white-waſhed with lime, and every practicable mode of purification adopted. Not a veſſel was ſuffered to approach the city, without ſatisfactory evidence of the healthy ſtate of the people, and the ſalubrity of the veſſel and cargo. See the letter from Hillary Baker, Eſq. mayor of the city, to the mayor of Baltimore, dated Auguſt 13th, 1798. Alas! all to no purpoſe! The ravages of the diſeaſe are well known.

If, ſays the late worthy mayor, the diſeaſe has eluded the health officers, I ſhall deſpair of future ſucceſs, unleſs the Weſt-India commerce ſhall be prohibited in the ſummer months, and magazines eſtabliſhed below for receiving the cargoes.

Similar proviſions in other ports have been eſtabliſhed with no better ſucceſs. The health laws at New-York, ſo far as appears, were as well executed in 1795, 96 and 98, when the fever was epidemic, as in 1794 and 97 when it was *not*. No viſible good effects are to be diſcovered in guarding againſt an epidemic; the utility of cleanſing veſſels therefore is limited to guarding againſt the operation of infection, upon a few perſons who may enter them, with foul air on board. Public health, ſo far as can be diſcovered, has never been ſecured by thoſe regulations. What ſeems to place this point beyond queſtion is, that for thirty years preceding 1792, no peſtilential fever ever ſpread in America, from the ten thouſand infected ſeamen and paſſengers, which arrived in the country from the Weſt-Indies, and during which time, in moſt places, not the leaſt precaution was ever uſed to guard againſt it ; yet ſince 1792, that is, under a ſtate of air, generating various epidemics, the peſtilential fever has appeared in ſporadic caſes, every year and in almoſt every town in America, and has raged as an epidemic in moſt of our large towns, in oppoſition to the utmoſt efforts of human ſkill. I am perſuaded, the concluſions from theſe facts amount to demonſtrative evidence, that infection is *not* the principal, or cauſe ſine qua non, of this terrible calamity.

The application of quarantine laws to our epidemic peſtilential fever, is juſt as uſeleſs, as the order of the Sultan, Achmet I. in the waſting plague of 1613, for tranſporting all the cats in Conſtantinople to the iſland of Scutari. The Jewiſh phyſicians told the Emperor, that the plague was occaſioned by the cats, and the poor cats were diſpatched into exile. Yet this did not reſtrain the plague.

People have been forever miſtaking the cauſe of the plague. In the firſt centuries of the chriſtian era, when diſputes ran high between Chriſtians and Pagans, theſe ſects mutually charged the plague each to the other. In 1349, the Germans aſcribed the plague to the Jews, and maſſacred great numbers of that race. In Paris, during a plague, many proteſtant *heretics* were ſacrificed, for bringing the calamity upon that city. And a propoſition has been made in America to ſtop all intercourſe with the Weſt-Indies and the Mediterranean, during the ſummer months ! Aſtoniſhing blindneſs !

But, it will be aſked, ſhall we have no health laws ? I anſwer, by all means. Their utility is obvious on many occaſions. Thus when an infected fleet arrives in a port, the town is in eminent danger, of what may be called a jail fever on a great ſcale. The quantity and virulence of infection thus imported, have produced deſtructive conſequences, as at Breſt in 1757, where were landed in November and placed in hoſpitals, about five thouſand diſeaſed ſeamen and troops from ſhips, moſtly out of De la Motte's fleet, from Louiſburg, with a malignant fever on board. The effect was that ten thouſand men died, in the hoſpitals, the ſucceeding winter, and many of the inhabitants of Breſt. But it will be remarked, that this infectious diſeaſe did not become an *epidemic* in Breſt; it ſpread only by infection; and as ſoon as that was diſſipated, the diſeaſe diſappeared. It raged in winter and ſubſided in ſpring. This is an important diſtinction, always to be obſerved by thoſe who guard the public health—an *epidemic* peſtilence begins when the ſeaſon or the ſtate of air favors it, and rages without control, againſt all human efforts; the common air becomes tainted, ſo as to produce the diſeaſe, without the infecting principle from bodies or clothes, and the diſeaſes ſubſide only at the command of the ſeaſons and the elements. Againſt ſuch, no legal proviſions are or can be of any avail, and ſuch is uſually the yellow fever of our country.

But diſeaſes propagated only by infection, like the jail and ſhip fever, never put on the form of an epidemic. They rage in crouded priſons and ſhips, where they are generated; and when multitudes are crouded into hoſpitals, they carry the evil with them; and all perſons, coming within reach of the infection, are liable to ſuffer. In this manner, Breſt loſt many of her inhabitants; a town in America is ſaid to have done the ſame, from the yellow fever, imported in Sir Francis Wheeler's fleet, as already related. But in ſuch caſes, the infecting diſeaſe requires contact or near approach to aid its propagation; and does not aſſume the complexion of an epidemic. The two ſpecies of diſeaſe are as diſtinguiſhable as light from darkneſs.

Thus, at the Black aſſizes in Oxford, in 1577, a malignant or jail fever of a ſingular kind, was produced ſuddenly—almoſt all the court and ſpectators were ſeized—many died—but no epidemic followed in Oxford; and in this inſtance, the effect was ſo ſudden, that the human body did not generate infection.

So alſo at the Old Bailey, not many years paſt, a few priſoners, entering the court from a dirty jail, without changing their dreſs, infected a large number of perſons who died; but no epidemic followed—the infection was ſoon diſſipated, and there was an end of the diſeaſe.

With our peſtilential fever, this is not the caſe, nor with any epidemic plague that ever exiſted. Remove the ſick, cleanſe the houſes and clothes, do whatever human art and labor is competent to effect, all will not avail—caſes ſpring up in every quarter, and the diſeaſe takes its courſe.

So it was in Candia in 1592, as related from Thuanus, under that year. As ſoon as the plague appeared, all the ſick and all the ſuſpected were removed from the city; but to no purpoſe; it raged till July—then abated without any human means and revived again in October.

Thus ſays the author of Traité de la peſte, "Univerſal cleanſings have proved uſeleſs; the plague has ravaged places after every precaution; and after negligence it has entirely ceaſed, as in Naples."

Such are the facts; and hence the neceſſity of diſtinguiſhing carefully between *epidemic* peſtilence, proceeding principally from general cauſes in the elements, and marked by other epidemic diſeaſes, by the failure of vegetable productions and by the ſickneſs, or death of cattle, fiſh and other animals—and *diſeaſes merely infectious*, generated by artificial means, which *may* be communicated, which may happen in jails, ſhips and camps, in the healthieſt ſtate of the elements, and which ceaſe, as ſoon as the infection can be diſſipated by purifications and freſh air. Without this diſtinction, the merit of legiſlative and police-regulations, can never be duly appreciated. Such regulations, applied to *epidemics*, as they continually are, prove totally futile—applied to diſeaſes of mere infection and of ſpecific contagion, as jail fever and ſmall pox, they may be and often are the means of preſerving multitudes of lives.

It is important therefore that health laws ſhould be judiciouſly framed and ſtrictly executed, becauſe there *may* be caſes in which public health will be preſerved by them; altho they never can reach the cauſe or prevent the ravages of epidemics, which originate where they exiſt.

With reſpect to merchant-men, health-laws may alſo be of ſome uſe, in preſerving the lives of ſeamen, and of perſons concerned in the veſſels. Sick men may generate a ſmall degree of infection; but on board of merchant-men, the number of ſeamen is too ſmall to infect a ſhip, ſo as to endanger public health, unleſs ſhamefully neglected.

The moſt danger from merchant-men is from the foul air generated, on long voyages and in hot ſeaſons, from periſhable and fermenting ſubſtances. From ſuch vitiated air, deprived of its vital principle, great danger may ariſe to the perſons who firſt open and enter the holds; and perhaps to a neighborhood. It is of great conſequence therefore to uſe ventilators freely on board of veſſels, freighted with periſhable articles; and to have them effectually cleanſed, before they are ſuffered to approach our wharves.

But I am not convinced that the air of ſuch veſſels ever yet *originated* an epidemic fever. It appears to me, that the Academy of Medicine in Philadelphia, lay more ſtreſs on this cauſe, than it deſerves. The ſphere of the operation of ſuch a ſmall morbid cauſe, cannot be extenſive; and all the foul air of the largeſt veſſel muſt be ſo attenuated by diffuſion, as not to produce deleterious effects, at any great diſtance. It may be injurious to a ſmall neighborhood; but I do not conceive it poſſible, that the noxious air of a few ſquare yards, can impregnate the whole atmoſphere of a city; and as to infection from the ſick, I have repeatedly proved, that this can never produce an epidemic. I will admit the *bare poſſibility*, that imported infection may enkindle the flame of peſtilence, in a place fitted for it by local cauſes, where no peſtilence would appear without a ſpark from infection. This is as much as I can admit to be poſſible, and more than I believe; after a more minute and careful inveſtigation of facts probably, than was ever before made in America. Moſt of the caſes I can find, where accurate accounts are preſerved, of ſuppoſed importation or communication of autumnal diſeaſes, fail utterly of proofs to ſupport common opinion; and many of them are incontrovertibly proved to have had their origin in the places where they have exiſted.

It is eaſy, I aver, to diſtinguiſh, in every caſe, the nature of peſtilence; that is, whether it is an epidemic, proceeding from a ſtate of the elements, or a diſeaſe generated ſolely by foul air, artificially collected. In a few weeks, if not a few days, a diſeaſe will ſhew whether it proceeds from infection only or from a general elemental ſource; and when it appears to proceed from the elements, men may juſt as well attempt to ſave the cats, the wild animals or the fiſh in the ocean from the effects of that principle, as their own ſpecies, by laws enjoining quarantine and purification of ſhips. The ſame cauſe that deſtroys the cats or the fiſh in one caſe, deſtroys human life in the other; and that cauſe exiſts in the elements; it is at home; quarantine laws do not reach it.

An epidemic diſeaſe may be diſtinguiſhed from a diſeaſe proceeding from infection or ſpecific contagion, by the following circumſtances.

1ſt. An epidemic peſtilence is preceded by influenza, affections of the throat, or acute and malignant fevers.

2d. An epidemic predominates over other diſeaſes; totally abſorbing them or compelling them to aſſume its characteriſtic ſymptoms. This laſt circumſtance is deciſive of the character of the diſeaſe.

A diſeaſe propagated by contagion or infection only is not thus diſtinguiſhed. It has no precurſors, it extends and ſpreads only by contact or near approach; and has no effect on the diſeaſes in its vicinity. The ſmall pox or jail fever, depending on mere infection, never expel a dyſentery or intermitting fever.

In every poſſible caſe, a plague that baniſhes other diſeaſes, as I believe it always does, is an epidemic generated in the place where it exiſts; for it is not poſſible that this expulſion of other diſeaſes, could take place, unleſs the epidemic depended ſolely on the elements. Simple infection would not change the ſymptoms of another diſeaſe, even in the next houſe, much leſs in all parts of a city.

To ſhow how little an epidemic depends on infection, let us advert to facts. In all the eaſtern countries, the plague is ſuffered to take its own courſe without reſtraint. There are no regulations to control its progreſs, or prevent its return. Its beginning is uſually gradual; a few die the firſt year; the proper ſeaſon ſuſpends its progreſs; the next year it is more general, and often, the third year is the moſt fatal.

It is remarkable, that after its moſt extenſive effects, it abates and ſuddenly diſappears. In London, the malignant precurſors of the plague of 1665, appeared as early as 1661; but no ſooner had its criſis paſſed, than in a few months, it was totally extinguiſhed. The ſame happened at Aleppo in 1762, and ſuch is uſually the fact.

Let any man ſuppoſe the diſeaſe to be propagated wholly or moſtly by infection, and attend to the conſequences. In Aleppo, ſays Ruſſel, died 500, in 1760; in 1761, died 7000, and in 1762, 11,000. On the principle of infection then, ſome ſick man or a bundle of old clothes, firſt ſpreads the diſeaſe, ſo as to deſtroy 500 lives—the infection of 500, deſtroys 7000 lives, the infection of 7000, deſtroys 11,000 lives; and the next year, the infection of 11,000 deſtroys—none at all!

In London, a few bales of cotton, ſmuggled into the city from Holland, in 1664, communicated infection that deſtroyed 68,000 lives; the infection from this immenſe number proves fatal, the next year, to 1900 only; and theſe, the year following, infect only 35! If infection has much concern in propagating that diſeaſe, its operation certainly defeats all arithmetical calculation of its phyſical powers!

The whole theory of infection, to which Mead has given ſo much celebrity, and which is maintained by many phyſicians in this country, is abſurd and ridiculous from firſt to laſt; leading legiſlators, magiſtrates and citizens aſtray from the truth, producing moſt ſerious inconveniences to commerce, and preventing the adoption of the only means of mitigating the peſtilence to which our cities are expoſed.

In Turkey and Egypt no pains are taken to cleanſe houſes or clothes after a plague. No ſooner has a great plague ceaſed, which has cut off 300,000 people in Conſtantinople or Cairo, than the infected houſes are filled by other people, who replace the dead, uſe the furniture and the bedding on which the infected had died ; or the old clothes are ſent to auction and purchaſed by Jews, who retail them out for uſe, uncleanſed ; and yet amidſt all this maſs of concentrated infection, no perſon has the plague, or if a ſporadic caſe occurs here and there, no epidemic enſues, for two, three or four years, perhaps longer ; then all at once, when the infection muſt neceſſarily be deſtroyed, by the action of air and water, the diſeaſe breaks out again, and becomes epidemic. Then ſome arrival from an infected place is hunted out, and the calamity is charged to the account of ſome poor ſick ſeaman, or his clothes ! The infection of half a million of people, produces no plague in one year ; but in another, the inviſible fomes of a piece of cloth, or the breath of a ſingle man is ſufficient to ſpread deſolation over a great city, or a kingdom !*

Such are the abſurdities of the modern notions about the plague, which adorn this ſplendid era of philoſophy and ſcience !—

Of the nature of the infecting principle in diſeaſes, we know very little ; and even its effects are not always comprehenſible. We obſerve differences alſo in the operation of the principle, which we cannot explain. Why the ſmall-pox ſhould be communicated, under *all* circumſtances ; the plague only under certain circumſtances, is a myſtery not yet unfolded. It is ſuppoſed, that the diſeaſed body diſcharges certain fine poiſonous particles, which are ſuſpended and diffuſed in the air, and being imbibed by the pores of the ſkin, and with the breath, excite the ſame ſpecies of diſtemper in a healthy body. Theſe effluvia generally eſcape our ſight and very often our other ſenſes ; but they may be concentrated in ſuch quantities, as to be very obnoxious to the olfactory organs, and even to excite ſudden nauſea in the ſtomach.

But why the effluvia from the ſmall-pox, anginas and the meaſles ſhould be independent of heat and cold ; and thoſe of dyſentery, plague, and other typhus fevers, ſubject to be excited into action by the one, and to be deſtroyed by the other, is a phenomenon never yet explained. We may ſay the particles iſſuing from the former claſs, are more ſubtle, volatile, and penetrating; but this is all conjecture. Certain it is, that the poiſon of ſmall pox, angina and meaſles, is of a more diſtinct, ſpecific kind, than that of the plague, leſs connected, in its operation, with putrid exhalations from other bodies, and leſs ſuſceptible of grades in its powers.

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* Hodges informs us, that after the plague in London, in 1665, people returned into houſes not cleanſed, and even ſlept in beds on which the infected had died, without fear or injury. This is not at all ſtrange. Unleſs the effluvia from the ſick have been cloſely confined and are greatly condenſed, they will not affect a well perſon ; and indeed it is a difficult thing to preſerve the morbid matter, in ſufficient quantity to communicate diſeaſe in cold weather.

So far as I am able to comprehend the nature of the infection of plague and other autumnal diſeaſes, paſſing under the popular name of *putrid*, it appears to conſiſt of a ſpecies of air, which is one of the elementary parts of all vegetable and animal ſubſtances. It may be what Dr. Mitchell denominates, the *ſeptic acid;* that fluid which is diſcharged from fleſh in the proceſs of putrefaction. It may be ſome other ſpecies; but it is very evident, from all its effects, that it operates, in producing diſeaſe, no otherwiſe than all the morbid exhalations extricated from every ſpecies of vegetable and animal ſubſtances in the putrefactive proceſs. In all or moſt of ſuch ſubſtances, there is, it is well known, a ſpecies of air or acid matter, which, when in a form detached from other ſubſtances, is highly noxious to health. To this fluid, or ſeptic acid, evolved from vegetables in a ſtate of natural putrefaction, and floating in an aerial form, is aſcribed the whole claſs of bilious fevers, which prevail near marſhes.

Hence, the effluvia from a perſon laboring under the plague, are ſuſceptible of all degrees of concentration, and in proportion to their concentration, will be their violence, and certainty of effect, when they attach themſelves to a healthy body. In this reſpect, the infection of the plague differs moſt eſſentially from that of the ſmall pox. The matter of contagion in the ſmall pox, however ſmall, is ſufficient to communicate the diſeaſe; and it is cuſtomary for phyſicians to wipe clean the point of a lancet, dipped in variolous matter, before it is inſerted in the ſkin, for the purpoſe of inoculation. It is alſo proved by experiments that the quantity of infection introduced by inoculation, whether more or leſs, makes no material difference in the number of puſtles, or violence of the diſeaſe.

But in the plague, the operation of infection is very different. This diſeaſe, if light, produces no infection, or very little—more violent caſes appear to be more apt to be communicated—and in great plagues, the infection is viſibly augmented. Yet in moſt peſtilences, an inſtantaneous expoſure to the effluvia from the ſick will rarely produce any effect, as in the caſe of ſmall pox and meaſles. It uſually requires a perſon to be a conſiderable time in the room with the ſick, in the plague, to receive poiſonous air ſufficient to excite diſeaſe ; and more generally, it is not communicated, without handling the ſick or imbibing his breath. In many caſes, all this expoſure for weeks and months together, will excite no diſeaſe. Hence Ruſſel repreſents the plague, as of different degrees of malignity and not always infectious. Hence the propriety of cloſe and indefatigable attention, in peſtilence, to every article of cleanlineſs ; for by this means, the quantity of infection is reduced, and the danger diminiſhed, from a high degree down to nothing. Not ſo, in ſmall-pox and meaſles, the contagion of which regards not filth or cleanlineſs.

The infection of the plague, dyſentery and the like ſeems therefore, to be nothing more than an *acceſs of noxious matter, to the local cauſes, morbid exhalations.* The noxious air of filthy ſtreets, docks and tenements, are ſecondary and augmenting cauſes of the plague ; when the diſeaſe appears, the effluvia from the diſeaſed ſtill *augment* theſe other local cauſes. Thus when a certain ſtate of air, in a city generally, will produce a malignant fever, and perſons are expoſed to it by walking in the ſtreets, a ſick perſon, confined in a cloſe room, will ſoon fill that room with exhalations from his lungs and pores, which will render that room *more dangerous* to a perſon in health, than the open ſtreet. This ſeems to be the amount of the infection of plague and other autumnal diſeaſes.

Thus alſo in a violent plague, the common air of the ſtreets becomes ſo highly infected, that perſons attending the ſick cannot poſſibly determin whether they take the diſeaſe from the common atmoſphere, or from their intercourſe with infected perſons. The only caſes which afford certainty in this reſpect, are, when the diſeaſed are removed into the pure air of the country, and nurſes and viſitors, who have breathed no peſtilential air in the city, are taken ill, in a few days after ſuch intercourſe with the ſick. Theſe would be clearly the produce of infection. But theſe caſes rarely occur. It has already been obſerved that the worſt caſes of peſtilence removed into the country, ſeldom infect the attendants. This ſhows how little apprehenſion ought to be excited by mere infection, and how ill-founded are the alarms in the country, about the ſpreading of the yellow fever; alarms that often occaſion a neglect of diſeaſed fugitives from the city. People in the country have little to fear from infection, if the ſick are kept in airy rooms and cleanly; they ought not to abandon the ſick; for the duties of humanity are not incompatible with their ſafety. It is the infected ground, if I may ſo call it, the local atmoſphere of peſtilence which is to be dreaded, and eſpecially by ſtrangers. During its prevalence, in a city or town, the air of the place is rank poiſon to perſons, accuſtomed to good air.

The preceding facts and diſtinctions enable us to form a juſt eſtimate of the importance of health laws. In nine caſes of ten, in which quarantine is enjoined, human efforts are oppoſed to the great laws of nature, and are therefore uſeleſs. In all caſes, where the air of a country exhibits evidences of a peſtilential conſtitution, in an increaſe of the number and violence of the ſymptoms of common diſeaſes; in the production of certain epidemics, as catarrh, anginas, meaſles, petechial fevers and the like; in the death of fiſh or the unuſual diſeaſes of cattle and other animals; in the production of inſects, uncommon in ſize, in kind or numbers; and other remarkable phenomena, before mentioned; in all ſuch caſes, the peſtilence which invades man will be found to ariſe ſolely from the uncontrollable laws of the elements; and quarantine will be utterly unavailing to guard cities againſt its introduction and ravages. The remedy is not applied to the ſource of the diſeaſe. Hence the efforts of the police in London in the laſt century, and of Dantzick and Marſeilles in this, were entirely uſeleſs; and hence the failure of all health laws to ſave our cities from the late epidemics.

Satisfied as I am of this truth, I would not lay aſide the application of theſe laws. The bare poſſibility of ſaving the lives of a few individuals, and eſpecially of diſeaſed ſeamen, is a good reaſon for cleanſing ſhips after long voyages, and of purifying their cargoes, when in a bad ſtate. But what I contend for, is, that we muſt not expect the beſt health laws, moſt rigorouſly executed, will ever be ſuccefsful in guarding cities againſt *epidemic* peſtilence. In our reliance on ſuch regulations, we expoſe ourſelves to perpetual diſappointment ; we expoſe the lives of citizens ; we overlook the true cauſes of the evil, and neglect the only means of preventing or mitigating its effects.

Further, the opinion of the ſpecific contagion of the plague has originated many, not only uſeleſs, but barbarous regulations. Such is the practice of confining the ſick to cloſe houſes ; and ſtill more, of confining the citizens of an infected town within its limits, by an armed force—which I am informed has been done in Europe. In Marſeilles, the firſt perſons ſeized were confined to their houſes by the point of the bayonet.

An ignorance of the nature of a diſeaſe and its degree of danger, may be pardonable in a prince or the legiſlators of a free ſtate. But there is a point, beyond which ignorance in medical profeſſors, becomes a crime. No ſcience is neceſſary however to convince any man, that moſt peſtilences, proceed only from the deranged ſtate of the elements, aided by the morbid exhalations of cities. This is a fact that may be known to a certainty by very little reading and obſervation. It was well known in paſt ages, when men were more governed by obſervation, than by theories and erroneous reaſoning. Mead's attempts to prove the ſpecific contagion of plague, aided by his popularity, had a moſt ſurpriſing ſucceſs ; his treatiſe was received as a ſtandard of truth ; it every where ſuſpended enquiries and checked a ſpirit of inveſtigation, which might have diſſipated error ; it was the baſis of the preſent laws of quarantine, which are applied, in thouſands of caſes, where they are as improper and as little wanted, as if applied to prevent an epidemic pleuriſy, or head-ache, embarraſſing commerce, without the ſhadow of neceſſity. But theſe are not the worſt effects. The erroneous ſyſtem of ſpecific contagion, has miſlead mankind into a fatal ſecurity, on the ſubject of the local cauſes of diſeaſes. Suppoſing the laws competent to guard public health, men have not attended to the beſt modes of conſtructing houſes and cities, and to the means of watering and cleanſing them—means by which all the ſlighter peſtilences might be avoided, and the more ſevere ones, greatly mitigated. Hence I am perſuaded, that the received theory of ſpecific contagion is the direct cauſe of moſt of the fatal plagues that now ſcourge civilized Europe and America. For it will be obſerved, that peſtilence has always been the *peculiar curſe* of *populous cities*. Of about two hundred general plagues, recorded in hiſtory, a few only have been ſo violent as to ſpread over countries into villages and farm houſes; almoſt all have been limited to large towns, evidently demonſtrating that they would never have affected mankind, without the influence of the impure air generated in thoſe places. This is a truth, as unqueſtionable as it is important; and on a conviction of this hangs the ſafety of men from that dreadful calamity. Had Mead, and other eminent phyſicians taken the ſame pains to lead mankind into truth, as into error, we ſhould long ago have introduced improvements into the arrangement and ſtructure of our cities, which would have ſecured our citizens from nine tenths of the infectious diſeaſes, by which they have been alarmed and diſtreſſed.

At the ſame time, had men underſtood the common operation of infection, which may be made obvious to the moſt ordinary minds, merchants would not, at this day, have been harraſſed with the neceſſity of performing quarantine, to guard againſt *epidemic* diſeaſes. We ſhould not have ſeen a ſhip from the Weſt-Indies condemned to the flames, in a Britiſh port, becauſe ſhe had loſt her crew by the yellow fever; nor merchantmen from an American port obliged to ride quarantine in the Britiſh channel, becauſe that diſeaſe prevailed in this country. Phyſicians, had they not been blinded by ſyſtem, and taken opinions for granted, without enquiry into the grounds on which they reſt, would have known before this, that the yellow fever will not ſpread in England, Scotland or Ireland. It never ſhows itſelf in America, without a much greater degree of heat, than the ordinary ſummer temperature of thoſe countries. The heat in thoſe latitudes rarely exceeds, for a few hours, in a ſingle day, 75 or at moſt 78 degrees by Farenheit. But no epidemic yellow fever is ever generated, in our climate, with that degree of heat. In general, we never ſee caſes of that diſeaſe in America, until we have had a period of heat riſing, for a conſiderable time, to 85 deg. or higher. In any ſeaſon of ordinary temperature, the yellow fever, in the Britiſh kingdoms, and other parallels of latitude, introduced from abroad by ſeamen or others from warmer climates, would immediately ſubſide and be extinguiſhed, without any human efforts. The caſes of malignant fever in England, which turn the body yellow, and which ſometimes occur, as mentioned by Lind, are generated about marſhes, in hoſpitals, camps, ſhips and priſons. An epidemic yellow fever, like that which prevails in America, was never known in England, and probably cannot exiſt in the climate. The quarantine enjoined on veſſels from the Weſt-Indies and United States, is utterly uſeleſs in guarding that country from this peſtilence in the form of an epidemic.

It may be ſaid, in anſwei to theſe remarks, that the yellow fever and plague are eſſentially the ſame diſeaſe ; the plague has often raged in Great Britain, and therefore the climate may not reſiſt the prevalence of the yellow fever.

But if the plague has raged in Great Britain, which is admitted, it muſt have ariſen from the unhealthy ſtate of the elements, which may exiſt in any latitude, or from very ſingular ſeaſons, aided by moſt powerful local cauſes, as in London before it was burnt. I ſay the yellow fever will not ſpread in England, in the *ordinary* ſtate of the elements, and the *ordinary* temperature of the ſummer. If peſtilence ever invades cool northerly countries, it muſt always proceed principally from diſorders in the elements and ſeaſons. The ordinary cauſes, in temperate or cool climates, have but little influence in generating peſtilence. Hence in common ſeaſons, in England, no plague, bilious or inguinal, could be ſpread, unleſs in a crouded jail, camp, or dirty, confined alley in a city. If the phyſicians in England obſerve the general ſtate of health to be good; no epidemics, with unuſual ſymptoms, prevailing; no uncommon numbers of inſects; or diſeaſes among cattle, or other ſymptoms of a morbid ſtate of the elements, it is no more in the power of man to render the plague epidemic in that country, than it is the pleuriſy or quinſey. I challenge all the faculty in Europe, to mention an inſtance, in which plague has ever prevailed, without ſuch phenomena.

Beſides, it ſeems to be probable, that more heat is neceſſary to generate and to propagate the bilious, than the glandular plague. My reaſons for this opinion, are, that the glandular plague appears in ſpring much earlier than the bilious. It often appears in the northern parts of Europe, as early as March and often in May, when the weather is yet cool. But the bilious plague of our climate has not ſhowed itſelf, in ſporadic caſes, till June, and then very rarely, and only in a few ſcattered caſes of a leſs malignant type, than at a later ſeaſon. To this remark, I have heard of only one exception. Generally, the diſeaſe does not appear till we have experienced ſome days of our hotteſt weather, and not till the laſt week in July, except in a few caſes as before mentioned. It does not become formidable, as an epidemic, till the tenth or twentieth of Auguſt.

This difference ſeems to depend on the following circumſtances. The glandular plague of Europe, Aſia and Africa, when it breaks out in the northern latitudes, as on the Baltic or in Great Britain, ſeems to be more eſſentially and principally the product of a defective ſtate of the elements, joined to human exhalations in large cities; both which cauſes are leſs dependent on heat, than the morbid exhalations of the vegetable world, which ſeem to give to our American plague its peculiar character, and to be a powerful cauſe of the diſtemper. I am further confirmed in this opinion, by this circumſtance. A diſtinction between the bilious fevers of our *cities*, and of our *marſhy grounds* on rivers, is obſerved to exiſt, in perfect analogy with the foregoing diſtinction between our bilious plague and the glandular plague. The mortal fevers, about marſhes in the interior of our country, are leſs infectious, than the peſtilential fevers of our cities, altho they are at times as fatal, and are characterized by a yellow ſkin. Theſe ſeem then to proceed *wholly* from vegetable exhalations. The fevers of our cities approach nearer to the plague of the eaſt, becauſe they proceed both from *animal* and *vegetable* exhalations, but the vegetable effluvia have a more predominating influence here, than in countries which are dry or better cultivated. Hence the mortal bilious fevers of our interior country evidently form a link in the ſeries of gradation, between the common remittents, and the yellow fever of our cities; juſt as the yellow fever conſtitutes a grade between our river or lake fevers, and the Levant plague.

The order of bilious fevers then ſtands thus in connection with their cauſes:—

In healthy periods.

Common intermittents, remittents—	ſolely from marſh effluvia, and ordinary cauſes.

In peſtilential periods, under the operation of elemental cauſes.

Intermittents, remittents—	of a worſe type, from marſh effluvia, aided by a general cauſe.
Bilious plague of the country, near lakes and rivers—	ſolely from marſh exhalations, with the general cauſe.
Bilious plague of American cities—	from the joint operation of vegetable and animal effluvia, with the elemental cauſe.
Inguinal plague of the eaſt—	principally from animal exhalations, with the elemental cauſe.

In this gradation of diſeaſes, there is a regular progreſſion of ſymptoms. Intermittents and remittents exhibit a yellow ſkin, more or leſs, but no infection worth naming—the river or lake plague, a very yellow ſkin, with morbid ſymptoms, but little infection—the bilious plague of cities, ſometimes a yellow ſkin, ſometimes not; and ſome caſes of glandular tumors, carbuncle and petechiæ; with more infection—the Levant plague, leſs yellowneſs of the ſkin, and uſually infection and glandular ſwellings. Thus, in proportion as the vegetable exhalations predominate, in the ſcale of exciting cauſes, there is more yellowneſs of the ſkin, leſs infection, and leſs frequent affections of the glands—in proportion, as the animal exhalations abound, as the cauſe, the yellowneſs declines, and the affections of the glands multiply, with augmented infection.

It is the remark of the celebrated Zimmerman, that "exhalations from marſhes do not ſeem to be ſo noxious in cold, as in hot countries; yet malignant fevers occur even in Finland. In Germany theſe exhalations produce tertians; in Hungary, petechial fevers; in Italy, hemitritæa; in Egypt and Ethiopia, peſtilential fevers." On Phyſic, p. 131.

It is therefore probable that a greater degree of heat, than the ordinary temperature of Great Britain, is neceſſary to generate the peſtilential fever of our cities. And as no degree of infection ever yet accumulated on board of a merchantman, can create a peſtilential atmoſphere, ſufficient to generate an epidemic, the fears of the Engliſh reſpecting ſuch veſſels from the United States or the Weſt-Indies, are utterly groundleſs. The marſh fevers of England, Scotland and of other cool climates, are of an inferior grade. Such are the autumnal fevers near the Fenn's of Lincoln, Ely and Cambridge. In Torbat, in Scotland, a putrid fever ſometimes prevails, and after death, the body turns yellow; this may be aſcribed to certain natural locks or ponds which ſometimes dry up in ſummer.

Sinclair's Scot. vol. 6. 418, 428.

But theſe diſeaſes, tho doubtleſs the ſame in ſpecies, fall greatly ſhort of the violence of our peſtilential yellow fever, which never did and probably never will prevail in that climate.

SECTION XVII.

Of the means of preventing or mitigating peſtilential diſeaſes.

THE firſt ſtep towards an effectual remedy for an evil, is to aſcertain its nature and cauſe, ſo far as they can be underſtood by effects. Primary cauſes are above the reach of man; proximate cauſes, may be ſo far inveſtigated, in moſt things, as to anſwer all the purpoſes of mankind.

It has been proved, in the preceding pages, and every day's obſervation confirms the fact, that one influential cauſe of epidemic diſeaſes, muſt exiſt in the elements, independent of all human control. In the production of epidemic catarrh or influenza, for inſtance, no human or artificial means appear to have any ſhare of influence. In the meaſles, artificial cauſes ſometimes modify the ſymptoms, but have no great ſhare in its production or propagation. A ſimilar remark will apply to every ſpecies of angina. The ſmall-pox is alſo modified in its force and ſymptoms by many local circumſtances; and its propagation is chiefly by means of contagion; but this diſeaſe alſo is ſometimes, tho rarely, generated in particular bodies without contagion. The appearance of thoſe diſeaſes in the form of epidemics, excepting the ſmall-pox which may ariſe from contagion, always indicates a peſtilential conſtitution of air; and during this conſtitution, ordinary or annual diſeaſes, which depend on ſeaſon or local cauſes, aſſume more violent ſymptoms.

Autumnal diſeaſes of the annual or ordinary kind, tho rendered more violent, fatal and extenſive, by a peſtilential ſtate of air, are however generated by ſubordinate cauſes, moſt of which are within the power of man. The dyſentery depends partly on ſeaſon, partly on ſituation, as to pure air, and partly perhaps on the imperfection of autumnal fruits. Sometimes it ariſes in camps from bad diet, or want of ſhelter from the weather; and when it once exiſts, is more or leſs propagated by infection. But this diſeaſe is rendered more malignant, by elemental cauſes.

Ordinary bilious fevers of all grades are produced uſually by miaſmata or morbid exhalations from low, damp, marſhy grounds; where vegetables, in the hot ſeaſon, are in a ſtate of rapid putrefaction. Theſe fevers occur annually, and with a violence of ſymptoms proportioned to the extent and force of the morbid cauſe. The origin and phenomena of all this deſcription of diſeaſes are ſo well known, as to render any obſervations of mine, unneceſſary.

The plague, glandular and bilious, ſeems to be nearly allied in its ſymptoms, to the ordinary bilious remittent. The point ſeems not altogether ſettled, whether the contagious yellow fever, as it is uſually called, and the common ſporadic yellow fever of the Weſt-Indies, and the bilious remittent, are different grades of one ſpecies of diſeaſe; or whether they are of diſtinct ſpecies.

On this point however, the late epidemics have furniſhed our ſcientific men with proofs that appear to me to decide the queſtion, in favor of the identity of the ſpecies. The evidence ariſing from the diſeaſe in Baltimore is alone ſufficient to decide it, as far as it regards the yellow fever and the remitting; and the Academy of Medicine in Philadelphia is a moſt reſpectable authority in favor of the ſame doctrin.

That the glandular plague of the Levant, and the bilious, infectious yellow fever of our country, are ſpecifically the ſame diſeaſe, I have no doubt; but they take ſome different ſymptoms, either from climate, or other cauſes unknown. The glandular tumors are held, by moſt writers on the plague, to be the characteriſtics of the diſeaſe, which alone decide its nature, and diſtinguiſh it from other malignant fevers. But Diemerbroeck and all the beſt authors agree that theſe external ſwellings are not eſſential to the diſeaſe, and that many have the true plague without them. They are however the uſual marks of the diſeaſe.

In our bilious peſtilence, theſe ſwellings are leſs common. But, tho rare, they ſometimes appear, in the moſt unequivocal ſorm of the true peſtis. I ſaw an inſtance in 1796; and they were more common in the laſt epidemic. An inſtance occurred, within my knowledge, in which two auxiliary tumors appeared, and the perſon was never confined by fever.

The yellowneſs of the ſkin has given name to the peſtilence of our country; yet this is a misfortune, for it may deceive a common obſerver. A yellow ſkin often accompanies lower grades of bilious fevers, not peſtilential; and is, by no means, eſſential to the infectious yellow fever. In all our late epidemics, perſons have died without exhibiting this color of the ſkin; and it has been leſs common the laſt year, than in former years. It appears then, that the lighter the epidemic diſeaſe, the more common the yellowneſs of the ſkin; and vice verſa. This is no inconſiderable proof of the identity of the bilious and inguinal plague; that in proportion as the bilious plague of our climate becomes violent and approaches the true plague, it loſes that yellow color of the ſkin, and aſſumes the glandular ſwellings. This I am informed is the fact, as obſerved by the phyſicians in New-York, the ſummer paſt. There are however ſome differences in the ſymptoms of the two ſpecies of plague, which it belongs to the faculty to obſerve and define. It may be that the moiſture of our country, not yet cleared of its woods, and abounding with ſwamps and marſhes, may occaſion the differences in the ſymptoms. The parts of Europe, Aſia and Africa where the plague moſt uſually prevails, are clear of woods, and cultivated. Perhaps an increaſe of population, and human effluvia, with a decreaſe of vegetable exhalations in America from cultivation, may in time change the form of our peſtilential fever into the true inguinal plague. I have reaſons for believing ſuch a change actually took place in Rome. Some of the plagues, deſcribed by Livy were obviouſly of the bilious kind, ſimilar to our epidemic fever; but in later periods, the plagues in Rome are expreſsly deſcribed to be, "peſtis inguinaria."

However this may be, the cauſes of peſtilence I ſuppoſe to be; firſt ſome eſſential alteration in the primary qualities of air and water, owing to ſeaſons, or to the action of the principle of fire, the main operative agent in the earth and atmoſphere; which alteration is demonſtrated by various epidemics and eſpecially by catarrh—ſecondly, the ſubordinate cauſes of plague, are, noxious exhalations of every kind, which diminiſh the proportion of vital air imbibed into the lungs. Both cauſes appear to produce diſeaſe, either by exceſſive excitement, inducing *indirect* debility; or by reducing excitement, and inducing *direct* debility. The aerial or elemental cauſe ſeems to produce exceſſive excitement; for its firſt effect appears in catarrh, a diſeaſe of ſtenic or inflammatory diatheſis. Thus the preſent epidemic conſtitution was preceded by influenza, of univerſal prevalence and of ſevere ſymptoms.

Meaſles, another diſeaſe that rarely fails to characterize the early ſtages of a peſtilential conſtitution, is alſo of an inflammatory diatheſis. The ſame is true of the common diſtinct ſmall-pox—another diſeaſe, which, before the art of inoculation, ſeldom failed to rage in cities, during ſuch a conſtitution.

Anginas are of different types; ſome of the milder kinds are ranged by Brown amomg ſtenic diſeaſes; but the angina maligna he conſiders as aſtenic. Diſeaſes of this claſs however form a part of the effects of a peſtilential conſtitution.

Next to this ſpecies of diſeaſes, may be arranged the petechial fevers, which under the names of purple, or ſpotted, have often overſpread Europe, and rarely fail to precede the plague. Theſe are the product of the laſt ſtages of a peſtilential conſtitution, next to the true plague, which marks the criſis. Theſe forms of malignant fever have never occurred in America, as epidemics; but purple and livid ſpots, vibices and all the variety of eruptions, which belong to that claſs of diſeaſes, occur occaſionally during peſtilence.

It is a remarkable fact, and one that ſeems to have eſcaped obſervation, that a peſtilential conſtitution of air in all ages and countries, produces epidemic diſorders of the *eruptive* kind. I queſtion whether in a ſingle inſtance, ſince the days of Moſes, the real plague, ever became epidemic, without one, two or all of that kind of diſeaſes for its precurſors. We cannot look into an author, who has deſcribed the diſeaſes which prevail in ſuch a conſtitution, from Hippocrates down to our time, but we ſee ignes ſacri, variolæ, morbilli or other *eruptive* diſorders, conſtituting a part of the deſcription. Theſe diſeaſes ſeem evidently to be claſſed by the laws of nature, and always to appear, in cloſe connection.

Hence the propriety of Sydenham's obſervation, p. 120 that "the eryſipelas, ignis ſacer, is a good deal like the plague, and ſometimes accompanied with pains in the glands—that it begins much in the ſame manner as the plague, but the plague is much more violent than an eryſipelas."

Hence alſo we obſerve that Hippocrates, in deſcribing a peſtilential conſtitution, mentions that before ſpring appeared "eruſipélata polla," many caſes of the eryſipelas, of a bad type, and mortal.

De morb. Vulgar. Sec. 2.

This is a curious phenomenon and worthy of inveſtigation, that a particular conſtitution of the atmoſphere, ſhould, in its different ſtages or in different ſeaſons of the year, tend to generate all thoſe diſeaſes, which throw out upon the ſurface of the body, petechiæ, vibices, a general efflorefcence and tumors, with various other appearances. It belongs to medical men to explain the general proximate cauſe, which, while its effects are various, ſtill gives to diſeaſes ſome common ſimilitude.

In America, a peſtilential conſtitution exhibits the ſame phenomena, as meaſles, and anginas, but without the purple or ſpotted fever, as the precurſor of our peſtilence. The immediate precurſors of the bilious plague in America, are catarrhous affections, diſorders of the throat, and eſpecially bilious fevers of a bad type, ending often in black vomit. Detached caſes of this latter diſeaſe rarely or never fail to introduce or precede the infectious epidemic.

But no diſeaſe whatever ſeems more cloſely connected with peſtilence than catarrh. An epidemic influenza, is almoſt invariably the ſignal of the approach of a peſtilential conſtitution; and during the whole exiſtence of the conſtitution, catarrhous affections are frequent in particular ſeaſons, and eſpecially juſt before or after the prevalence of a peſtilential fever. This circumſtance affords no inconſiderable evidence, that what we call an epidemic conſtitution acts upon the human body as a violent ſtimulus. The firſt diſeaſes excited by it are uſually of the inflammatory diatheſis as catarrh and meaſles. Hence perhaps we derive a clue to explain the myſtery of the peſtilential diſeaſes which ſucceed.

The continued effect of exceſſive ſtimulus, muſt be debility. The epidemic conſtitution, when it firſt commences, is mild, and produces ſtenic diſeaſes, not very mortal, as catarrh and meaſles; for a very obvious reaſon, the force of the ſtimulus is not at firſt ſufficient to haſten on the indirect debility of the ſyſtem, or to produce the aſtenic diatheſis in a fatal degree. But as this ſtate of air advances in ſtrength, the ſtimulus is greater; and when aided by the heat of ſummer, produces a degree of excitement, that ſpeedily induces univerſal debility. Hence the peſtilential fevers of ſummer and autumn ſeem to be the effect of exceſſive ſtimulus, acting upon the ſyſtem with ſuch violence, as to produce ſpeedy debility, in conſequence of which, all the functions of the ſyſtem are weakened and deranged—the ſtomach does not digeſt food—the periſtaltic motion is imperfect and feeble—the liver and the gall-bladder do not perform their ſecretions—the energy of the brain is diminiſhed—the extreme veſſels are relaxed. The conſequence is, that part of aliment which ought to be ſeparated and carried off by the inteſtines, as the hepatic fluid, is retained, and forced out of its proper ducts, into other parts of the ſyſtem, where it excites external eruptions, efflореſcence, or yellowneſs; in every part of the body, becoming rank poiſon, and ſpeedily inducing fever, morbid affections, and diſſolution.

This proceſs is infinitely modified by ſubordinate cauſes; as ſeaſons, which are extremely various; local exhalations and ſtagnant air, which are deleterious according to their force; the various modes of living, which ſtrengthen or weaken the human body; and accidental circumſtances, as fatigue, grief, fear, expoſure to exceſſive heat, or ſudden cold; and innumerable ſimilar cauſes.

This idea of the proximate cauſe of the bilious plague of our climate was imbibed from obſervation and converſation with phyſicians, before I had read Brown's Elements of Medicin. I am happy enough to find, on reading that work, a confirmation of the opinion. That author obſerves, paragraph 137. " Sometimes the ſecretory veſſels ſeemed crammed with a colluvies of fluids, capable of producing indirect debility, as in that overflowing of bile, which diſtinguiſhes the yellow fever of the torrid zone."

This " colluvies of fluids," lodged in the ſecretory veſſels, ſeems to act like poiſon, in diſorganizing the ſyſtem. And the reaſon why the plague is ſo often incurable, ſeems to be the rapidity and the imperceptibility of the action of that poiſon, which appears totally to undermine the vital powers, before it exhibits much pain or fever. This is not its common mode of operation ; but it is not unfrequent. Caſes of this kind are ſoon characterized by a total proſtration of ſtrength, a cadaverous look, and a dull, glaſſy, languid eye, ſo often deſcribed by medical writers. In ſuch caſes, debilitating remedies precipitate death ; and ſtimulants are ineffectual to revive the languid functions.

In moſt caſes however the approaches of the diſeaſe are accompanied with pains, uneaſineſs, and febrile ſymptoms, while the ſyſtem yet retains its ſtenic diatheſis ; in ſome ſuch caſes, debilitating remedies are uſeful ; but the rapidity of the progreſs of the poiſon ſoon changes the diatheſis to aſtenic.

Boyle remarks vol. 1. 672, " that a day or two before the plague has manifeſted itſelf, in ſome perſons, their viſion has been affected ; objects appearing diverſified with beautiful colors. A vomit adminiſtered to ſuch, uſually gave relief." Every obſervation of ſuch eminent men deſerves conſideration ; but I do not remember to have found the ſame in any other author. If juſt, is it not an evidence that the ſtate of air, inducing the diſeaſe, operates *firſt as a ſtimulus ?*

Procopius has recorded of the plague of 543, a phenomenon ſomewhat ſimilar to that noticed by Boyle. He ſays, perſons imagined they ſaw phantoms or ghoſts, which made them ſuppoſe they were ſmitten by ſome perſon. Such as had this imagination, ſoon periſhed with the plague.

In 746 alſo perſons were troubled with phantaſtical images which filled them with terror. See alſo the plague in Carthage before Chriſt 404.

General appearances favor the idea, that what is uſually called an epidemic ſtate of air, produces, in the human ſyſtem, unuſual excitement by exceſſive ſtimulus. But then how ſhall we account for the angina maligna, a diſeaſe of extreme aſtenic diatheſis, which often forms one of the ſeries of epidemics, belonging to the ſame conſtitution? Is this alſo the effect of exceſſive excitement, inducing great debility? Is not its prevalence principally among children of ſound health, a proof that it is the conſequence of indirect debility?

However theſe queſtions may be decided, certain it is that under the ſame conſtitution, and during the ſame peſtilence, the fatal diſeaſes aſſume very different ſymptoms, and exhibit, in different bodies, a different diatheſis. In all epidemics of this ſort, a principal object of the phyſician is to aſcertain the general diatheſis produced by the conſtitution of air, and the various effects of it in different bodies. "Hic labor, hoc opus eſt."*

The ſecondary or auxiliary cauſes of plague, coming under the denomination of *impure air*, are ſuppoſed to act upon the ſyſtem, by directly debilitating powers. "It cannot be doubted, ſays Brown, 145, that the application of air, to the whole ſurface of the body is a neceſſary ſtimulus. The air is ſeldom applied in a pure ſtate; it is commonly blended with *foreign matters, that diminiſh its ſtimulating power*, and tho its ſalutary ſtimulus depends upon its purity, it is uncertain whether ever its purity goes ſo far as to ſtimulate in exceſs and thereby produce ſtenic diatheſis." I know not what this author would call "purity of air," but I am very certain that an epidemic influenza proceeds from ſome qualities in the atmoſphere, and this author agrees the diſeaſe to be of ſtenic diatheſis. If the diſeaſe is the effect of "foriegn matter," infuſed into the air, then this foreign matter is of a ſtimulating quality.

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* Is not the doctrin of indirect and direct debility, as the ſource of all diſeaſes fully implied in the firſt paragraph of Ariſtotle's firſt problem? It may be thus rendered. "Why have great exceſſes a tendency to produce diſeaſe, but becauſe they occaſion too much or too little excitement, in which all diſeaſes conſiſt." If this is not the preciſe idea of the author; his doctrin leads to the ſame reſults, as thoſe which form the ingenious brunonian ſyſtem. Many things appear to us *new*, which are 2000 years old; and ſolely becauſe we neglect ancient authors.

I ſuſpect however that the atmoſphere ſhould be conſidered as compoſed of two principal ſubſtances, *air* and *fire*, or *electricity*. Morbid matter floats in the *air*, but the principal ſtimulating power probably conſiſts in the *electricity* of the atmoſphere.

The influence of morbid exhalations from putrefying ſubſtances, is, probably to diminiſh the ſtimulant power of the atmoſphere, inducing direct debility. The lungs receive, at every breath, a certain quantity of air; that is, about the ſame cubic quantity. A certain portion of this, is vital air, oxygen, which ſerves as food for the lungs and blood, and which is ſeparated from the reſt and abſorbed. Whenever therefore common air is impregnated with an undue proportion of hydrogene, or with any ſpecies of acid, which is hoſtile to the lungs, theſe viſcera want their proportion of food, or ſtimulus; the conſequence is, their action is weakened, and the heart and arteries want their due force; the effect of which is a more feeble circulation of blood. Perhaps alſo the ſeptic acid, conveyed to the blood with common air, at every inſpiration, gradually deſtroys its texture.

Sorbait mentions that a lighted candle being placed near perſons dying with the plague, a livid vapor has been ſeen, iſſuing from their mouths. Extremely vitiated muſt be the air from the lungs, before it can be rendered inflammable.

But whatever may be the proceſs, we know the effects of reſpiration in air vitiated by morbid exhalations, to be fevers of various kinds, as intermitting, remitting, dyſenteric, and putrid or peſtilential. That ſtate of the atmoſphere which I call *peſtilential*, has a ſingular effect in increaſing the irritability of the nervous ſyſtem, by which means ſlighter cauſes than uſual occaſion dangerous inflammation.

Having then arrived at the probable cauſes of the peſtilential fevers which afflict the earth, we are prepared to conſider the means of prevention.

The firſt article under this head, is, the removal of all local cauſes of diſeaſe; ſuch as every ſpecies of putreſcible ſubſtances, which, in the proceſs of putrefaction, emit a ſpecies of air highly unfriendly to health. It will be obſerved that I ſpeak of *putreſcible* ſubſtances ; for fleſh or vegetables, which have undergone the proceſs of putrefaction, or of digeſtion in a healthy ſtomach, diſcharge little or none of the pernicious acid.

Hence we obſerve that people in cities rely too much on cleanſing ſtreets to preſerve public health. Experience proves that the utmoſt care in cleanſing ſtreets will not always prevent peſtilence. The reaſon is obvious ; moſt of the filth of ſtreets conſiſts of excrementitious matter from horſes or oxen, which has undergone the proceſs mentioned, and contains no ſeptic acid, or very little. Hence the accumulation of dung in the farmer's yard, is not known to generate diſeaſes.

Various other ſubſtances, thrown into the ſtreets of cities, are more pernicious ; as green vegetables, the garbage of fiſh, lees of fermenting liquors, and many others, which, in hot weather, ſoon putrefy and diſcharge noxious air. Such ſubſtances however never ought to be thrown into the ſtreet in hot weather ; they ſhould be thrown into the ocean, into rivers of running water, or what is better ſtill, *buried*, and that before putrefaction begins. If putrefaction is begun, they ſhould be removed in covered veſſels.

The vaults of cloacina, altho they contain moſtly ſubſtances, which have paſſed through digeſtion, and in their unmixed ſtate, are not *very* pernicious, yet they are always mixed with other ſubſtances, which, in hot weather, bring on fermentation. Theſe ſhould be either cleanſed annually in ſpring, or the matter in them neutralized by quick-lime.

All filthy ſubſtances ſhould be removed from ſtreets, both for the ſake of decency and of health. If the pavements of ſtreets could be covered with pure earth, it would greatly leſſen the heat ; but this is not practicable. The only effectual remedy, is freſh running water—the only article that unites cleanlineſs with coolneſs. Nothing, in a city, can be an adequate ſubſtitute ; for while it removes the cauſes of noxious vapors, and by cooling the ſultry air of a city, prevents debility, it extricates a conſiderable quantity of new and wholeſome air, from its own ſubſtance, and abſorbs pernicious vapors.

Streets ſhould alſo be ſo conſtructed as to give the water a conſiderable velocity. The practice of levelling the ſurface of a city, is moſt pernicious. If poſſible, every ſtreet in a city ſhould have a deſcent of fifteen or twenty degrees. Inſtead of levelling the earth, the police of a city ſhould counteract even a natural level, by throwing the whole into artificial elevations; which give a briſker currency both to water and air.

Cellars ſhould be ſo conſtructed, as to retain no water; and often cleanſed by ſcraping. If the ſurface of the cellar can be conveniently changed, by removing a few inches of the old earth and introducing that which is freſh, it would be a very ſalutary labor. Nothing imbibes and neutralizes infectious matter, more readily than freſh earth.

The liberal uſe of water, in and about a houſe, cannot be too ſeriouſly recommended. Water abſorbs all noxious matter that comes in contact with it in ſubſtance. Applied to floors, wooden, ſtone or brick walls, to clothes, to furniture, to back-yards and ſtreets; it is every where ſalutary in the ſummer months. Dr. Prieſtly obſerves, that water purifies vitiated air, by abſorbing the ſeptic part. Hence its great utility as a preſervative againſt peſtilential diſeaſes.

All dead animals in a city or its vicinity, ſhould be buried or burnt; as cats, dogs and horſes. The indecency alone of ſuffering their carcaſes to putrefy before the eyes of mankind, ought to make it a ſtrict article of police, to remove them. But they ſhould be buried; not one ſhould be permitted to offend the eyes or noſtrils of a citizen.* They are offenſive to decency, to moral ſentiments and to health. The ancient method of burning dead bodies was well calculated to deſtroy the poiſon; but in Atlantic America, burial is cheaper and equally effectual.

Common ſewers are often common nuiſances. In cities, all filthy ſubſtances ſhould be conveyed off, on the viſible ſurface of the earth, unleſs ſewers can be ſo conſtructed as to depoſit, with certainty, all their contents in running water. Serious evils ariſe from putrid ſubſtances lodged in ſewers, that are too level, and which ſerve as reſervoirs inſtead of canals, accumulating putreſcible matters, in places where their exhalations, by the influence of moiſture, are doubled, inſtead of being removed.

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* From two years obſervations, made as I paſſed daily from New-York to my reſidence in the country, I judge from twenty to thirty worn-out-cart-horſes die and putrefy in the ſuburbs of that city, every year.

In cities, where all filth is naturally caſt by rains into the docks, it would be well that all wharves ſhould be ſo conſtructed, as to preſent a ſmooth uniform front to the ſtream, and be extended into deep water. Mud, waſhed by the ſalt tides, and not mixed with putreſcible matters, produces no inconvenience to health ; but ſuch matters, thrown into docks, bare at low water, and expoſed to a hot ſun, diſſolve moſt rapidly, and generate morbid vapors. Many improvements are yet to be made in our ſea-ports, which will leſſen the accumulation of pernicious air.

A great and moſt deſirable article in a ſyſtem for the preſervation of health, is, the purifying of rooms from air which has been reſpired for a length of time. By experiment it is found that the air of rooms that have been ſlept in, is very inſalubrious ; and probably more ſo, than the air of privies, which is found to contain leſs noxious air than was formerly ſuppoſed. See Encyclopedia, art. Atmoſphere. Indeed, it is queſtionable whether there is any *neceſſary* connection between offenſive ſmells and inſalubrity. Nature has kindly provided that dead feces ſhould not be very pernicious to health ; but the effluvia of living and fermenting bodies are to be avoided as rank poiſon. In this reſpect cleanlineſs is made eſſential to health.

It is impoſſible in a work of this kind to enter upon the details of cleanſing a great commercial city. The magiſtrates, aided by medical men, in every city, will attend to the minute regulations for preſerving a pure air.

But there are other cauſes of autumnal diſeaſes, which muſt not be overlooked.

It is remarked by writers that the diſeaſes from marſhes and ſtagnant waters are moſt violent near their ſources ; and gradually abate in their violence and become leſs common, as they recede from thoſe ſources. See Buel on the marſh fevers at Sheffield. Medical Repoſ. vol. 1. 457. Hence, in a country generally mountainous or hilly, dry and ſalubrious, but containing here and there a pond of dead water or marſh, the bilious fevers generated by the effluvia, will be local, rarely extending beyond one mile and a half from their ſource.

But there are ſome extenſive marſhes, which may produce effects to a much greater diſtance. Such are the low grounds in Hungary, a ſickly region; the pontine marſhes near Naples, which may affect the health of people in Rome; the flat lands and rice plantations in Bengal on the Ganges—the coaſt of Terra Firma in South-America, and the marſhes from E. Florida to the Delaware in North America. The fevers of Cambridge, Ely and Lincolnſhire in England, may be claſſed with thoſe above mentioned; but are of ſmaller extent.

It is an opinion in Conſtantinople that the frequency of the plague in that city, is to be attributed to the northerly winds, which come from the marſhes of Tartary and Ruſſia, bordering on the Euxine, ſweeping that ſea, and conveying moiſture and noxious exhalations.

The poſition of that city is otherwiſe a very healthy one—the climate is temperate—the ſite of the city, high, dry and riſing into hills and mountains on the weſt. No cauſe of unuſual diſeaſes can be found in the neighborhood. The cauſes within the city, are powerful. Many of the ſtreets are narrow, filthy, crouded, and almoſt obſtructed by pent-houſes. But in this reſpect, Conſtantinople is not worſe than one half the cities of Europe. Shall we then admit that winds will convey morbid exhalations, ſeveral hundred miles, without diſſipating them, ſo as to render them innoxious? Let us attend to other facts.

No city in Europe, except Conſtantinople, has been more frequently deſolated by plagues, than Rome, from the time of Romulus to the cloſe of the laſt century. Shall we aſcribe this, to the vaſt marſhes which border the ſhore from the mouths of the Tiber to Naples? Certain it is, that Rome has ever been conſidered, as a very unhealthy city; and the terrible plagues which ravaged it, when in the utmoſt proſperity, as well as in modern times, juſtify this opinion. So ſenſible have the inhabitants been of the prevalence of this opinion abroad, and the ill-effects of it in preventing ſtrangers from reſorting to the city, that Lanciſius, an eminent phyſician of the preſent century, wrote a conſiderable treatiſe, evidently with a view to remove this opinion.

This author obſerves, that ſouth winds at Rome, if violent, humid, with clouds and heat, produce inconvenience, and if they paſs over marſh, they may bring "particulas lethiferas," very pernicious vapors, which produce peſtilential diſeaſes.

The Romans very early took meaſures to correct the evils to which the city was expoſed. The enormous cloacæ, or ſewers were raiſed at a vaſt expenſe, to carry off all ſtagnant water, and dry the ſoil, and while kept clean, were very uſeful. Hence cloacina was deified as the goddeſs of health. Theſe ſewers were under the care of certain officers, called "Curatores Cloacarum Urbis." In one inſtance, theſe drains had been a long time neglected, and were cleanſed at the expenſe of a thouſand talents. Severe laws were enacted, prohibiting individuals, under penalty of a fine, to ſuffer water to ſtagnate.

Lanciſius aſcribes the ſevere diſeaſes which afflicted Rome, in the decline of the Empire, to the deſtruction of the aqueducts and neglect of the ſewers. In 1695, when the ditch of Adrian's tower, and the great ſewer of the city Leoninæ, were filled with filth, immediately on the blowing of the ſouth wind, began peſtilential diſeaſes. By order of the Pope, at this author's ſuggeſtion, the ſtreets, vaults, ditches and all ſimilar places, were thoroughly cleanſed, and ten years after, no epidemic malignant diſeaſe had appeared. He however obſerves that when a ſouth wind blows for *a long time*, acute fevers, tertians, pains in the head, and vertigo become epidemic. This muſt be occaſioned by the debilitating effects of that wind, or by miaſmata conveyed from a diſtance, probably from the pontine marſhes.

See Lanciſius, paſſim.

Egypt is a flat country, containing not much marſh, but annually overflowed, and ſubject to moſt of the inconveniences of marſhy countries, from the drying of its moiſt ſurface, in very hot weather. Here again we have a nurſery of peſtilence.

The banks of the Euphrates and Tigris are nearly in the ſame predicament, and Baſſora, is in Perſia, what Cairo, is in Egypt.

Moſt of the coaſt of South America, from Carthagena to the Oronoke, is bordered with marſh, and is every where ſickly.

But what ſhall we ſay to the marſh on our own ſhore? The low ſwampy lands that border all the rivers, in the flat country of Maryland, Virginia and the Carolinas, and the immenſe tract of bog in Virginia called the *diſmal?* The effects of them on the neighboring inhabitants are well known—annual and almoſt univerſal intermittents, and often, remittents.

Is it not poſſible and probable, that the noxious exhalations from theſe vaſt hot-beds of putrefaction, are borne on the ſouth-weſterly winds, which prevail almoſt conſtantly in June, July and Auguſt, and which run parallel with the general trending of the coaſt, from Florida to New-York? Do they not impregnate the whole atmoſphere for a conſiderable breadth, and ſweep the country, from the eaſtern ſhore of the Cheſapeek to Philadelphia, New-Jerſey, and in a ſlighter degree, to New-York? I do not give a poſitive opinion on this ſubject; but the annual prevalence of ſlight intermittents on York-Iſland, and in the city, tho far removed from any marſh, and continually ventilated by ſea breezes, as well as waſhed by rapid tides, affords ſome ground to believe this ſuggeſtion.

It is confirmatory of this idea, that ſoon after leaving York-Iſland towards the eaſt, all intermittents diſappear; unleſs in a very few places, where they proceed from obvious local cauſes: Now it muſt be obſerved, that the coaſt of the United States, runs generally from ſouth-weſt to north-eaſt; but at New-York, it takes a different courſe, and runs about eaſt by north, for two hundred miles. This courſe ſoon carries the people on the ſhore, beyond the reach of the ſuppoſed ſtream of morbid vapor, from the ſouthern marſhes, whoſe courſe is with the ſouth weſterly winds.

I am not attached to this idea; but it is in conformity with the opinion of the inſalubrity of the Euxine winds at Conſtantinople; and with the effects of the ſoutherly Calabrian wind, blowing over the pontine marſhes, towards Rome. Lanciſius relates a remarkable fact. Thirty gentlemen and ladies went on a party of pleaſure, towards the mouth of the Tiber. The wind ſhifted ſuddenly, and blew from the marſhes, "paludes oſtienſes," and twenty-nine of them were immediately ſeized with a tertian. If ſuch was the effect of the vapors from thoſe marſhes, we may ſuppoſe the vaſt pontine marſh would poiſon the air to a much greater diſtance.

That the extenſive moraſſes, along our ſouthern ſhore, are pregnant with miſchief to that country is certain; that the people of Philadelphia and New-York are affected by them, may be poſſible. It would therefore deſerve conſideration, whether the evil will admit of a remedy. There are two modes of rendering marſhy lands and ſtagnating water ſalubrious—one, by draining the lands and cultivating them; the other, by turning into them ſtreams of running water. It is probable that moſt of the marſh at the ſouthward, being within reach of tides, and below high water, is incapable of being drained. It is the pontine region of North-America. How far the ſecond plan can be applied with ſucceſs, I have not the local knowledge of the land and rivers to determin. The claſſic reader will recollect the inſtance, related in hiſtory of Empedocles, the Sicilian philoſopher and poet, who put an end to peſtilential diſeaſes, among the Saliuntii, by turning two ſtreams of good water into the marſhes, from which they originated.

If there is a poſſibility of drying any of the lands, now covered with poiſon, or of putting the dead water into motion, the United States have a vaſt intereſt in effecting that object; and expenſes are not to be put in competition with the health and lives of our citizens.

The ſame remark is applicable to all the marſhes in other parts of the country, as about ſome of the lakes; and to all ſmaller ſources of diſeaſe, ſwamps and ponds. In every poſſible ſituation, where ſtagnant water contains vegetable ſubſtances in abundance, diſeaſes muſt prevail. Running water, on the other hand, is ſalubrious. It not only does not exhale morbid air, but it generates freſh and pure air; at the ſame time, it creates a gentle breeze by its current, which helps to diſſipate any noxious particles in its neighborhood which may ariſe from other ſources.

People in the country cannot be too careful in ſelecting a ſpot for their habitation. The queſtion, of continued health or diſeaſe, of long life or premature death, hangs very often upon the choice of a ſalubrious ſituation for a houſe.

A farmer ſhould never plant his dwelling by the ſide of a marſh. Whatever may be the ſituation of his lands, he is inexcuſeable, if he builds his manſion within a mile of the ſources of diſeaſe and death. Better for him to go a mile and a half to his daily labor, enjoying robuſt health, than to live within the circulation of poiſonous vapors, afflicted by diſeaſes for three months in the year. And when a farmer has the misfortune to be obliged to labor occaſionally in the vicinity of ſtagnant water, he ſhould be careful not to enter upon the ground early in the morning, before the noxious vapors have been raiſed and attenuated by the heat of the ſun, nor ſhould he continue there, till late in the evening.

People in the country ſhould ſelect hilly or elevated poſitions for their houſes; where the ſurface of the earth is dry, and there is a free circulation of pure air. There is another reaſon —the water on high grounds is always better than in low, ſwampy places. Water in flat lands ſtagnates beneath the ſurface, as well as above; but on hills, it is in conſtant motion. Hence if men expect good water they muſt ſeek for it on mountains, hills and riſing grounds. The Arabians adviſe that houſes ſhould be ſet on high, airy places, near freſh water.

When a choice of difficulties occurs, and men are compelled to live near marſh, they ſhould endeavor to place their dwelling on the windward ſide of the marſh, which, in America, is the ſouth and weſt; the ſummer winds being from theſe points. This will often make a prodigious difference in the ſtate of health.

The fables of antiquity are moſtly obſcure and not well underſtood by the moderns; but ſome of them are eaſily explained, and contain moſt excellent leſſons. The ſtory of Python, the huge ſerpent, which alarmed and infeſted the world, until he was ſlain by Apollo, is of this kind. Python was generated by the action of heat on the mud and ſlime, which covered the earth, after the receſs of the water of Ducalion's flood. That is, Python was diſeaſe, proceeding from noxious exhalations, in hot ſeaſons, which was deſtroyed by Apollo, the ſun, which dried and purified the earth. See Ovid, Metam. lib. 1. This fable had its origin in Egypt, where Python was killed by Iſis and Orus.

Of what conſequence is it that we read books, if we neither underſtand nor practiſe the leſſons they contain ?

But after attending to every circumſtance that can aſſiſt in guarding health from the annoyances that are local and viſible, we have a further taſk to perform, to leſſen the effects of that elemental principle of diſeaſe, which has been proved to exiſt, in every clime, at certain unequal periods. If, it will be ſaid, ſuch a cauſe of epidemic diſeaſes, does in fact exiſt, and operate on every ſpecies of life, vegetable and animal, this cauſe is above human control ; all our efforts to avoid its effects, are uſeleſs ; and we are doomed by the decrees of heaven, to be the victims of peſtilence, without hope or remedy.

To this I anſwer ; that if all hiſtory is not a forgery, the ſtate of the elements, has, in few inſtances, been ſo ill-adapted to ſupport health and life, or ſo poſitively pernicious, that men have periſhed by millions, in the moſt healthy regions, expoſed to no local cauſes of diſeaſe whatever, except ſuch as exiſt in the moſt healthy periods. This I muſt believe ; but the fact affords no ground of complaint againſt providence ; for the ſame fate has attended all other ſpecies of animals. The horſe, the ox, the ſheep, the dog, the cat, the fowls, and the fiſh, are ſubject to the ſame univerſal law of the phyſical world ; and on what principle will man arraign this diſpoſition of all created life, or claim an exemption from the laws, to which all other ſpecies of animals are ſubjected ?

But we are not altogether without hope, even in the deſperate circumſtances mentioned. If we attend to the cauſes of plagues, we ſhall find they all tend to deſtroy life by *one general effect*, which is, *debility*. Either directly or indirectly, all the exciting cauſes cloſe their operation on the ſyſtem, by inducing *debility*, leaving the nerves, muſcles, and inteſtines in a relaxed, languid ſtate.

If this principle is juſt, and it is agreeable to the medical idea that debility is the cauſe of all fevers, we have a clue that will lead us to the means of eſcaping the evils of peſtilence.

In the morbid ſtate of air, producing the uncontrollable peſtilences, which have aſſailed man in the healthieſt ſituations on the globe, we obſerve that the moſt terrible effects have been produced, in ſeaſons, when the air has been warm, humid, unelaſtic, with light ſoutherly breezes ; as in the reign of M. Aurelius, of Gallienus, and of Edward III. This ſtate of the air ſerved very much to aid the peſtilential principle, in debilitating the human body. All local cauſes probably tend to the ſame effect.

The great deſideratum then is, how to counteract the debilitating operation of theſe cauſes, and *preſerve the tone of the ſyſtem.* I am perſuaded that all the means of prevention are compriſed in that idea. No man is taken ill with this furious diſeaſe, until his nervous ſyſtem and his inteſtines ceaſe to perform their uſual functions, and ſecretions are ſuſpended or diminiſhed. Hence perſons, as long as their evacuations are regular, may walk with ſafety in the moſt infected places, until their eyes and their color exhibit the poiſon that is imbibed ; yet they will not ſuffer by the diſeaſe, while the veſſels have ſtrength to diſcharge the morbid matter by regular ſecretions and evacuations. This is a known and a common fact.

Hence ſome perſons and even phyſicians have reſorted, during the plague, to ſmall doſes of calomel, or other purgative, to keep open bowels. A moſt pernicious practice to thoſe in health, for it induces the very evil meant to be avoided, *debility ;* and ultimately, the inteſtines becoming unable to perform their functions, diſeaſe and death enſue. I am well informed of a number of caſes of this kind, in New-York, the laſt ſummer, which ended in death.

The *true means* to preſerve the natural tone of the body, are the *moſt natural means.*

Firſt. Food is the natural ſtimulus of the ſyſtem. During peſtilence therefore this article demands the firſt notice. It is agreed by all writers, and obſervation juſtifies the opinion, that temperance is eſſential to health, during a ſickly ſeaſon. Some perſons, miſtaking temperance for abſtinence, have run into an extreme of abſtinence, which has been fatal to them. The true point to be obſerved, is, to take as much food and drink, as will ſuſtain the body in its uſual degree of ſtrength ; without overcharging it with ſtimulus. Too much food produces unuſual excitement, which is followed by indirect debility, a ſtate of body which invites an attack of peſtilence. Too little nouriſhment, on the other hand, induces direct debility, a ſtate equally favorable to diſeaſe. I have good grounds for believing ſome very valuable citizens of New-York, of my acquaintance, fell ſacrifices to their exceſs of caution in the uſe of food, during the laſt epidemic.

It is not improbable that different conſtitutions of air, as they produce various ſymptoms in the ſame diſeaſes, may require or admit of very different degrees of ſtimulus, applied to the human body. The epidemic in New-York in 1795, like that in Philadelphia in 1793, was characterized with inflammatory diatheſis, more frequently than in 1798. Hence veneſection, which had acquired great celebrity in 1793, loſt part of its credit, in 1798, and was uſed with more diſcrimination and caution.

I ſuſpect the ſame circumſtance has changed or modified the opinion of the great utility of abſtaining from generous diet and liquors. This opinion was general and well received in 1795; nor have any caſes come to my knowledge, in which the practice was ſuppoſed to be injurious. But in 1798, many inſtances occurred where perſons of the moſt ſlender habits, of ſtrict abſtinence from ſtimulating diet, and who weakened the ſyſtem by purges, were ſeized with uncommon violence by the peſtilence, and periſhed. On the contrary, I am acquainted with ſeveral phyſicians, who took their uſual quantity of food, with ſome wine and more than their cuſtomary quantity of porter, who attended the ſick, thro the ſeaſon, viſiting the moſt infected places, without ſuffering the leaſt inconvenience to their health.

If the point is admitted that debility is the great proximate cauſe of this diſeaſe, which I think cannot be conteſted, the conſequence is plain, that whatever tends to reduce the vigor of the ſyſtem below its uſual ſtandard, muſt be prejudicial, during its prevalence. Hence the propriety of rather increaſing than leſſening the uſual quantity of food, or natural ſtimulus; carefully avoiding, at the ſame time, all exceſs in eating or drinking, which is equally dangerous.

Another thing to be obſerved, in ſummer, and eſpecially in time of peſtilence, is, the guarding the body, but by all means, the head, from the direct rays of the ſun. Nothing is more dangerous than the burning heat of a clear ſun, in ſultry weather. It often produces ſudden death, by means of an apoplexy, inſtances of which are related under the year 1752, to have happened at Charleſton; and the ſame is ſaid to have taken place there, the ſummer paſt. In other caſes, the effect is, what is called a ſtroke of the ſun, "coup du ſoleil," which is not always fatal, but very dangerous.

But the moſt general ill-effect of expoſure to a hot ſun, is, great debility, in conſequence of the violent and unnatuaral excitement; and this effect is moſt to be found in the nervous ſyſtem, when the heat has fallen directly on the head. Convaleſcents from bilious fevers have occaſion to be particularly cautious, not to to expoſe themſelves to a hot ſun; a relapſe is the moſt certain conſequence.

The umbrella is an excellent invention; it would be ſtill more excellent, if it could be improved, ſo as to render the ſhade more general, and completely interrupt the rays of the ſun, without being rendered too heavy.

In walking the ſtreets of a city, in a clear hot day, the paſſenger will naturally ſeek the ſhady ſide. Of ſo much importance is it thought, in ſome hot countries, to ſhield the body from the rays of the ſun, that very diſcerning men contend that narrow ſtreets and high houſes, in cities, contribute to the health of the citizens, by mitigating the heat. They ſuppoſe the obſtruction of air a leſs evil, than a hot ſun. Of this opinion was Lanciſius.

But this is to embrace one evil, in ſhunning another. It is to be regretted that the beſt mode of ſhielding man from a hot ſun, is not adopted in cities. Wide ſtreets, bordered with rows of trees, would be infinitely preferable to all the artificial ſhades that can be invented. Trees are the coolers given to us by nature. They make a pleaſant ſhade—they imbibe the ſeptic fluids, which impregnate the atmoſphere of cities, and poiſon their inhabitants—they exhale pure air—they fan the earth, by creating or augmenting currents of air, with the vibratory movement of their leaves—they invite the feathered tribe to light on their branches, and with the muſic of their notes, to relieve the ear from the grating of rough, unnatural ſounds, which ſtun the citizen.

It has been objected to trees, that they increaſe the danger of fire, by obſtructing the free uſe of engines. This objection is imaginary. Few caſes would occur, where trees, properly placed, could interfere with the operations of extinguiſhing fire ; and in ſuch caſes, they might be levelled in a moment.

It has alſo been objected, that trees obſtruct the free circulation of air. This is not true. In calm ſummer weather, they very much increaſe a light breeze, by partly obſtructing the upper current with their branches, and throwing more air below, thus augmenting the under current on the ſurface of the earth, where it is wanted. The leaves and branches alſo, by their gentle motion, agitate the air, preventing the ill effects of ſtagnation ; and give velocity to the air that finds its way through their interſtices.

" The ſtreets and public ſquares of a city, ſays St. Pierre, ſhould be planted with great trees of various ſorts. A city, built of marble, would to me have a melancholy appearance, unleſs I could ſee in it trees and verdure."

Studies of Nature, 13.

Trees and all green vegetables diminiſh greatly the heat near the earth ; and little do men in general think, how prejudicial to health is the operation of the extreme heat of cities.

It is not an uncommon thing in the country, where no miaſmata exiſt, for laboring men to over heat themſelves in the field, and die in ſix days, with a bilious fever ; their bodies as yellow as ſaffron. This is yellow fever of a mild kind, generated in the ſyſtem, by the debility occaſioned by exceſſive heat and fatigue, without any external cauſe. Thus the extreme heat of Auguſt and September 1798 will alone account for the unuſual violence and extent of the peſtilential fever of that year.

In the warm ſeaſon, and eſpecially in time of epidemic fevers, people ſhould be doubly cautious not to expoſe their health by exceſſive fatigue. Labor ſhould not be violent, and walking, moderate. In extreme heat, the natural excitement of the ſyſtem, is uſually too great ; and a ſmall addition to it throws the body into a ſtate of debility which invites diſeaſe. Not only health, but life, is often ſuſpended on the point of half an hour's exerciſe. Temperance in labor, bodily or mental, is as eſſential to good health, as in eating or drinking. The muſcles and the nerves, thoſe moving powers of the human body, if ſtimulated beyond a certain point, loſe their excitability, beyond the poſſibility of recovery.

The danger incurred by ſedentary and ſtudious men, during peſtilence, from the debilitating effects of their occupations, is greatly increaſed. Want of due exerciſe is directly relaxing to the ſolids; while application of the mind is apt to over-excite the nerves and induce indirect debility. The extreme irritability of the nervous ſyſtem, is obvious in a peſtilential ſtate of air. —I experienced it moſt ſenſibly in the ſummer of 1795, during the fever in New-York; and it is evidenced in the vertigo, ſo frequent at ſuch times; in the ſeizure of many perſons in the plague with apoplectic ſymptoms; and in the palſies and apoplexies which are greatly multiplied before or after the prevalence of a peſtilence, and which in ſome places, have become almoſt epidemic.

During the rage of epidemic peſtilence, alſo the animal appetite ſhould be indulged with moderation—exceſſive indulgence, which might have been ſuſtained at other times, has often hurried the young and ſprightly, to a premature grave. Nothing can be more dangerous, according to all medical writers on this ſubject.

Celſus directs that in peſtilence, perſons ſhould ſeek freſh air, travel, ſail; or if theſe are not convenient, they ſhould avoid fatigue, indigeſtion, cold, heat, exceſſive indulgence of the animal deſires; eſpecially ſays the author, in a peſtilence which is occaſioned by ſoutherly winds. Vol. 1. 40, 41.

Theſe obſervations are not new; they are common and well known to medical men, and to all others of diſcernment. They are here inſerted, becauſe they may be, in this work, more generally read, than in medical books, which are opened only by profeſſional men.

But all theſe rules, if ſtrictly obſerved, will not, in a more violent plague, be ſufficient to ſecure the body from attack. Such are the extremely debilitating qualities of the air, in ſome periods, that it will be neceſſary to counteract them by artificial powers poſitively tonic.

The application for this purpoſe, which is moſt eaſy and effectual, is *water ;* an article which nature has furniſhed in the greateſt abundance, becauſe it is far the moſt uſeful. On this ſubject perhaps ſome of the following ideas may not be very common.

My attention to water, as a preventative of peſtilence, was firſt excited by a paſſage in Volney's Travels in Egypt and Syria, chap. 17. where he informs us in a note that " at Cairo, it is obſerved, the water-carriers, continually wet with the freſh water they carry in ſkins upon their backs, are never ſubject to the plague."—The author is there ſpeaking of the pernicious effects of humidity on health ; but the eſcape of the water-carriers, he aſcribes to *lotion,* whoſe effects are different from thoſe of moiſture by vapor.

If this fact is accurately ſtated, it is worth an empire. I am inclined to believe it and to aſcribe the eſcape of thoſe men to the conſtant application of water to their bodies, during the labors of the day. Yet if true, why have not authors propagated the knowlege of ſo important a truth, to every part of the world ? Is this neglect alſo the fruit of the pernicious errors reſpecting the excluſive origin of the plague from infection ? The calamities ſuſtained by mankind, in conſequence of thoſe errors, exceed all calculation.

How is it poſſible, that, if a remedy for the calamity of peſtilence, is ſo obvious and ſo near at hand, the Egyptians ſhould not have applied it univerſally ? Can this be aſcribed to the doctrin of predeſtination, which makes them careleſs of the means of prevention ?

It is very certain that the laws of Moſes, reſpecting the prohibition of blood, fat, ſwine's fleſh, and certain other animals ; as alſo the whole ſyſtem of ablutions, purifications, and uſe of perfumes, were intended to correct the evils of the climate ; and many of his directions became totally uſeleſs, when the Iſraelites left that country and its vicinity. Heaven never could intend ſome of the proviſions of the Moſaic code, for more temperate and healthy climates.

The ancient Egyptians had ſimilar practices, and probably long before the days of Moſes. Their laws and cuſtoms to enſure cleanlineſs were very ſtrict, and they involved a moſt liberal uſe of water. Herodotus expreſsly declares that "they ſcour their cups, waſh their linen, and *circumciſe for the ſake of cleanlineſs*. The prieſts bathe twice by day and twice by night, and are obliged to wear linen." Swine's fleſh was alſo conſidered to be unclean and prohibited as an article of food.

See Book 2. Euterpe.

Theſe regulations doubtleſs proceeded from the experience of their good effects. It is not improbable that the introduction of the Mahometan religion, may have been accompanied with the abolition or diſuſe of ancient practices, which were friendly to health. Certain it is, that the oriental nations make great uſe of baths; the original deſign of which was probably to guard againſt diſeaſes, but which have been abuſed and converted to the purpoſes of luxury.

Let us then purſue the idea of applying water as a panoply againſt the attacks of peſtilence. By what means does water guard the body from that diſeaſe?

I have already quoted the obſervation of Dr. Prieſtley, to prove that water abſorbs the ſeptic acid. If this opinion is well founded, and I have no doubt of it, we have obtained a moſt eſſential item of knowlege. Freſh water frequently applied to the body receives and carries off all the matter of infection, thus removing *one* copious ſource of the diſeaſe.

Savary remarks, that peſtiferous matter, paſſed through water, will not communicate the diſtemper. This is a confirmation of Dr. Prieſtley's principles.

The ceſſation of the plague in Egypt, on the inundation of the Nile, is no ſmall evidence of the ſame principle. The water changes the ſtate of the air, both by abſorption, that is, imbibing and carrying off the peſtiferous ſources of vapor from the earth; and by extricating a quantity of freſh air. And this important fact directs to the mode by which all great cities are to prevent or leſſen the force of this diſeaſe. What the Nile does once a year for Egypt, freſh ſtreams of water ſhould do every day, in the hot ſeaſon, for all large towns—they *ſhould inundate the ſtreets.* Nature has given, in Egypt, the moſt ancient and the moſt common nurſery of the plague, the *model* of the beſt remedy for the ſevereſt calamity incident to man; a model which few cities have been wiſe enough to copy.

But it will not be ſufficient to truſt wholly to the effect of a diffuſion of water over a city. In the hot ſeaſon, it ſhould be applied to the body very frequently in the way of lotion or bathing. By this I do not mean to recommend the practice of leaping into river or ſea-water, and continuing in it for half an hour—a practice which proves fatal to many lives every ſummer. Cold water is the moſt powerfully debilitating application, that can be made to the body. No perſons can bear it, even in ſummer, but the healthy and robuſt; and to ſave ſuch from injury, it muſt not be applied when the body is over-heated, or continued too long. Many—many inſtances occur every year, in which a fatal yellow fever is ſpeedily induced by injudicious plunging. An inſtantaneous application of cool water to the body, by a ſingle plunge, or by a ſhower bath, ſometimes acts as a ſtimulant, by a ſudden increaſe of excitability in the ſyſtem; but this ſhould be uſed as a remedy, under the direction of a phyſician. Few perſons can ſuſtain the ſhock, unleſs in good health; and I am perſuaded it would be as well for mankind, if the uſe of cold water by plunging, were wholly proſcribed. Judiciouſly applied, it is ſometimes uſeful; but my own obſervations lead me to believe, the utility is more than overbalanced by its fatal or miſchievous effects.

The moſt ſafe, eaſy, pleaſant and beneficial mode of uſing water, is, to bathe or waſh the body in a private apartment at home. This may be done in ſeveral ways—either in a large veſſel immerſing the whole body at once; or, what is leſs troubleſome, with a ſingle pail or bowl of water, in a bed chamber. The waſhing may be done with the hand, or a ſponge, in a few minutes, as the perſon riſes in the morning or retires, at night.

The temperature of the water ſhould be near that of the blood; a little cooler or a little warmer, and in ſuch a temperature, it is a pleaſant application, occaſioning no violence to the ſyſtem.

It may not be obvious to every common reader, that the application of warm water to the ſurface of the body, in a hot day, ſhould cool it. But ſuch is the fact, and nature points out this mode of reducing the heat of the body, by the proceſs of perſpiration. In this proceſs, the inſenſible vapor, which eſcapes by the perſpiratory ducts, takes with it a portion of heat—and the more freely a perſon perſpires, the more temperate, the heat of his body. Hence the human body is enabled to ſuſtain heat, ſeveral degrees above that of the blood—and hence the fleſh of a child, in full health perſpiring freely, feels cooler than the air, in a ſummer's day. This phenomenon may be illuſtrated by a thermometer, with the utmoſt eaſe. Immerſe the bulb into warm water, in a hot day. Let the water be of 75 degrees of heat and the air, of 80 degrees. The thermometer, ſtanding at 75 deg. in the water, and taken out into a warmer medium, the air, ought to riſe to 80 deg. but being wet, the evaporation will ſink the mercury four or five degrees; that is to about 70 deg. until the inſtrument is dry, when it will riſe to 80 deg. the temperature of the air.

On this principle warm water, as well as cool, will leſſen the heat of the ſyſtem; for no ſooner does a perſon ceaſe to apply the water, than evaporation commences and cools the body by ſeveral degrees. This effect however is temporary, in conſequence of the ſtimulus of the heat.

In very hot weather it is better, eſpecially for *perſons in the vigor of health*, to uſe water a little cooler, than the blood; for the effect of warm water, applied in the manner propoſed, is to ſtimulate—and this is not what the body requires. On the contrary, when highly excited by the heat of the air, the body requires a reduction of heat, to prevent over-excitement, and its effect, indirect debility. In general then the body in ſummer is to be cooled by the uſe of water, while in a healthy ſtate; but if debility or diſeaſe has invaded it, it requires heat and excitement.

Perſons of a *ſlender habit*, who require additional ſtimulus, ſhould uſe water a little warmer than the blood. The effect of cool water applied to perſons in full health, and of warm water, to feeble habits, is the ſame; to *prevent debility; indirect* in the former caſe, and *direct*, in the latter.

Bathing a long time in very warm water, to produce profuſe perſpiration, is a powerful laxative; and perhaps it would be better, if it was never uſed, except as a remedy for diſeaſe, under the direction of phyſicians.

The beneficial effects of the uſe of water, in peſtilence, therefore, are theſe.—The poiſonous particles compoſing infection, and exhalations of all kinds, are waſhed from the body, and their ill effects prevented—the morbid matter exhaled from the body by the perſpiratory veſſels, is alſo removed—an effect that may be aided by frequent changes of clean linen.—The extreme veſſels are ſtimulated and cleanſed, by which means they are enabled to carry on more perfectly the excretions; perſpiration being one of the principal reſources of nature to expel the poiſon which enkindles the flame of peſtilence.—The whole ſyſtem is kept in equilibrio, by a diminution of excitement, in the robuſt, and an increaſe of it, in the debilitated; the conſequence is, the ſyſtem is daily renewing its tone and vigor, the energy of the brain is preſerved, the muſcular fibres retain their powers, and all the functions of the body, the digeſtion, circulation, ſecretions, and evacuations, are regularly performed.

Medical gentlemen will excuſe me for theſe ideas, which belong more properly to their province. They are not new to that deſcription of citizens; but, if juſt, they ought to be univerſally known; for they lay the beſt foundation for a regular plan of economy, in domeſtic life, which will greatly alleviate the diſtreſſes of autumnal epidemics. I cannot help thinking that mankind are yet in their infancy, in this reſpect; and that in general they underſtand the true art of living, which ſhall ſecure health and happineſs, as little as they underſtood agriculture or naval architecture, in the days of Henry the firſt.

I am perſuaded that the whole art of ſecuring ourſelves from peſtilence, as I have before remarked, conſiſts in this ſimple maxim—"preſerve the natural energy of the ſyſtem." That water, freſh and pure, is the inſtrument moſt efficacious for this purpoſe, I muſt believe, from reaſon and experiment. The fact related by Volney of the eſcape of the water-carriers, is of infinite weight, if fairly ſtated; and demands immediate application to our own caſe. At any rate, it demands inveſtigation.

I have other proof of the ſucceſs of water, uſed as I have preſcribed. A friend of mine, who has lived many years in the Weſt-Indies, who has ſeen the yellow fever in all its forms, who has tended the ſick in that climate and in New-York, expoſed himſelf to their breath and effluvia for days and nights ſucceſſively and ſlept with his own ſon, when on his death-bed, with that diſeaſe, has hitherto eſcaped the infection. He aſcribes this impunity to a daily uſe of water in the manner abovementioned.

We are not to calculate on the univerſal and invariable ſucceſs of any remedy for this terrible calamity. Multitudes of men will not take the pains to uſe the means neceſſary to reſiſt the effects of the numerous cauſes of diſeaſe which ſurround them. They will neither regulate their diet, nor cleanſe their perſons and habitations; and when to the influence of their own intemperance, and the poiſon generated in their houſes and on their bodies, is added the debilitating operation of peculiar ſeaſons and other cauſes which are above human control, great numbers of them muſt ſink and periſh.

Nor is it to be ſuppoſed that any human means can, in every caſe, guard life, in a peſtilential ſtate of air. If we admit *debility* to be the univerſal proximate cauſe of the plague, we are not ſure that our beſt efforts to obviate its effects will always ſucceed. We may not be able to find or to apply, in all caſes and under all circumſtances, the preciſe degree of ſtimulus, neceſſary to preſerve the corporeal functions; and the variety of conſtitutions, and diverſe operations of the ſame remedies on different bodies, will defeat, in ſome caſes, the moſt exact application of the beſt poſſible ſyſtem.

Of one thing I am confident, that, in our cities as now conſtructed, no rigors of police can ſo effectually cleanſe away the ſources of poiſon, as to prevent a return of peſtilence, without the univerſal introduction of a new domeſtic economy, and new modes of living. I am firmly perſuaded that fruitful ſources of the evil lie in theſe two articles—the exceſſive uſe of ſtimulant food and liquors, and the neglect of perſonal waſking. The diet of the Americans, like that of the Engliſh, is of the moſt nouriſhing kind—a large portion of the beſt fleſh meats, and high-ſeaſoned fiſh and vegetables. Our drink is of the ſame character—the beſt high wines, ſpirits and brandy.

In winter, our bodies ſuſtain this ſtimulant mode of living; the extreme cold continually reſiſting its effects by its debilitating powers. But when ſummer arrives, and the violent ſtimulus of heat, is added to the high ſtimulus of the beſt diet, two claſſes of men fall a ſacrifice to violent fevers. Firſt, men who puſh their ſtimulus beyond the powers of nature, by exceſſive exertion, and imtemperance in eating and drinking—hence a robuſt man riots in debauch to day, and four days after is in his grave. Secondly, men who live freely in winter, and reduce their diet too low in ſummer, to avoid diſeaſes, inducing a weak, languid ſtate of the ſyſtem.

It muſt be obvious to any perſon in America, that the French mode of living, in regard to diet, drink, and the liberal uſe of water, protects them from the epidemic diſeaſes which prey upon the Americans, and Britiſh natives. Nor have I the leaſt doubt, that a ſuitable regimen, purſued rigorouſly by the Europeans, would have ſaved one half the people, who periſhed in the black peſtilence in 1348.

Unfortunate ſouls! They believed the plague to be communicated by infection only; they ſought ſafety by flight; they embarked on board of veſſels, and launched out upon the ocean, to *eſcape infection;* but all in vain; the diſeaſe attacked them in every ſituation, and the world was almoſt diſpeopled. Had they known that the diſtemper was induced ſolely by the debilitating qualities of the elements and the ſeaſon, what multitudes would have applied the true remedy, and ſurvived! Thanks to a kind providence, ſuch a ſingularly depreſſing ſtate of the air, rarely occurs, but when it does, there is no flight from the ſources of diſeaſe, as in ordinary plagues, which ariſe in the impure atmoſphere of cities only; but men muſt have recourſe to the applications which reſiſt the effects of debility, and maintain the energy of the ſyſtem by ſupplying the defective powers of the elements, with artificial ſtimuli.

I cannot cloſe this ſection, without a few remarks on the general plan of building large towns.

The ancient mode of conſtructing cities bears ſome characteriſtics of the age and taſte of the nations, in which they were reſpectively founded. Moſt of the old cities were evidently built with reference to a ſtate of war and robbery; being intended for ſafety, rather than for convenience; as appears by their narrow ſtreets and the projections of the upper ſtories of the houſes. The more people could be crouded into a ſmall ſpace, the leſs military force was neceſſary to defend the town.

However this may be, thoſe cities were very ill-conſtructed for the purpoſes of health. Savary aſſerts that 200 perſons in Grand Cairo occupy leſs ſpace than 30 in Paris. The ſtreets are ſo narrow and full of people, that they joſtle againſt each other, and ſometimes a man is obliged to wait ſome minutes, before he can make his way. Letter 3. Yet this ſame author alleges the plague to be *not native* in Egypt! Surely a man of ſcience need not go out of Cairo to look for cauſes of peſtilence.

Many ſtreets in Conſtantinople are narrow and crouded like thoſe in Cairo.

The old city of London, before the *fortunate* conflagration of 1666, was in a like predicament; its ſtreets narrow and almoſt cloſed above by the jutting of the upper ſtories of the houſes. In the old ſtreets, which eſcaped the fire, notwithſtanding all the improvements of modern days, which have mitigated the violence of peſtilential diſeaſes, I am informed people are ſtill infeſted with nervous and typhus fevers. London is however greatly indebted to the conflagration. In the preſent conſtruction of the buildings, *one* perſon, it is ſaid, occupies as much ground as *two* did before the fire. The ſize and arrangement of houſes and apartments are alſo improved; and better adapted to a free circulation of air. The introduction of freſh water may alſo be numbered among the beſt preſervatives from diſeaſe. Theſe are among the cauſes of the non-appearance of the plague in modern London, and the diminution of the annual bills of mortality, within the laſt half century.

The plague however has diſappeared in other cities of Europe, where no ſuch improvements have been made—a curious fact, that will be hereafter conſidered.

But the diſeaſe continues to prevail occaſionally in the eaſtern parts of Europe, in Hungary, Poland and Ruſſia, which were ſeverely ravaged in 1770, and 1771. The diſeaſe alſo raged at Oczakow, on the north border of the Euxine as late as the year 1739.

That part of Europe abounds with marſhes and ſtagnant water, and conſiſts moſtly of level land. This may account for the continuance of the plague, in that quarter.

The United States unfortunately contain ſimilar ſources of diſeaſe, in number and extent ſcarcely equalled. Yet inſtead of profiting by the ſevere diſtreſſes which all great cities have ſuffered once in fifteen or twenty years, from peſtilence, and guarding againſt the artificial cauſes of it, our anceſtors began and we are continuing to build cities, on the Gothic plan, without more regard to the lives and happineſs of our citizens, than that which was manifeſted by the barbarians of antiquity. The moderns however proceed on the ſame plan from a different motive, which is, avarice. It is now the intereſt of the proprietors of lots in a city, to which all the pleaſure of living, and the health of citizens, are ſacrificed.

We are preciſely in the latitudes moſt favorable to the production of peſtilence. In the tropical climates, conſtant heat ſoon fits the human body to ſuſtain it, and the *natives* of thoſe climates are ſeldom affected by the furious rage of epidemic peſtilential diſeaſes. Within the tropics *ſtrangers* alone are ſufferers by the climate.*

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* Savary remarks " that the plague ſeldom reaches the polar circle and never paſſes the tropics. The caravans of Cairo, Damaſcus and Iſpahan, which are ſometimes infected, never propagate it at Mecca, and Yemen is ſafe from the plague." With few exceptions theſe obſervations are juſt. If the natives of cool regions paſs ſuddenly into tropical climates, they are ſubject to violent fevers ; but the reaſon aſſigned in the

But in the temperate latitudes, men are continually ſubject to the alternations of extreme heat and cold—changes hoſtile to the ſyſtem. In winter, we may be ſaid to be inhabitants of Lapland; in ſummer, of Mexico or the Weſt-Indies. If we do not remove to the polar circles or to the tropics, yet the revolutions of the ſeaſons *bring their climates to us;* and we annually run a ſimilar riſk with the Europeans, who paſs from the northern to the ſouthern latitudes of *periſhing in multitudes.*

It is a moſt unqueſtionable fact that the northern ſtates of America from New-York to Maine, are in a poſition on the globe, as expoſed to the plague as the cities of Marſeilles, Naples, Rome and Conſtantinople; and the ſouthern ſtates have a poſition correſponding with the latitude of Syria, the Barbary coaſt and Egypt; that portion of the earth which is *moſt frequently* ravaged with peſtilential diſeaſes.

If then we live in a climate in which the human body, from alternate heat and cold, is moſt irritable, and moſt ſubject to malignant autumnal diſtempers; and if a part of our country is peculiarly adapted to the production of ſuch diſeaſes; the moſt ſerious of all queſtions ariſes; what ſhall we do to prevent a frequent return of ſuch calamities?

To me, the path is extremely plain. Our climate we cannot change—much of our country cannot be raiſed into hills, nor drained of its ſtagnant waters—the laws of nature we are unable to control in the operation.—But *our* duty is plain. Men muſt not plant their habitations near marſhy grounds—the mode of building cities *muſt* be totally changed—and ſo muſt the uſual habits of our citizens.

Throughout the whole Atlantic territory, on the low lands, it is more eſſential that large towns ſhould be purpoſely conſtructed for health.—Great cities are uſually founded on commerce, and commerce requires the acceſs of navigable water. Hence ſuch towns are commonly near the ſea ſhore or on the borders of rivers.—But if they are near low marſhy grounds they cannot be

text is ſufficient to account for the perpetual exemption of *natives* of hot climates from the worſt form of peſtilence. Their bodies mould themſelves to the climate—their excitement or debility is always uniform. It is the great changes, in theſe reſpects, which expoſe people in the middle latitudes to the attacks of peſtilential diſeaſes.

healthful. High and dry poſitions, with rocky or gravelly earth, are the proper places for populous cities, on account of freſh air and good water.

But in any ſitation, our cities are too crouded for health or comfort. Lots are too ſmall—too many people are crouded on to a little ſpace of ground. A family to every lot of 25 or 30 feet by 80 or 100, connot fail to generate too much filth, and to vitiate the air in too great a degree, for the health of the citizens. In every large town in the United States, however remote from marſh, and however healthy its poſition, the effects of crouded population are obvious, every autumn, in the ſickneſs and death of *children.* Multitudes and multitudes of lives are anually ſacrificed, in all cities, to the avarice of the original proprietors of lots. The little narrow dirty houſes, kitchens and yards ſurrounded with high fences, excluding air and vegetation; all that can diſſipate or abſorb the noxious exhalations; all that can purify the atmoſphere and refreſh the exhauſted frame of a human being, panting beneath a ſultry ſun—every thing in our cities is contrived to *waſte the powers of life, and ſhorten its duration.*

Men, in this reſpect, are infinitely leſs ſagacious than *irrational* animals. Inſtinct guides the beaſts of the field to the moſt proper habitations—and they never reſide where they are *annoyed.* But man, with all his boaſted reaſon, ſees the effects of his folly, and hundreds and thouſands of his fellow citizens falling victims to his own neglect, his miſtakes or his ſordid principles; he heaves a ſigh in Auguſt and September, as he views the ſable hearſe, conveying his friends in ſcores to their graves; in November he ſhrugs his ſhoulders and ſays, *it is all over;* runs to the circus, the theatre and the card room; laughs away the winter's evening with his jovial companions, ſome of whom are deſtined, the next ſeaſon, to fall a ſacrifice to the ſame folly and neglect, and to fill new ranges of graves by the ſide of the victims of the preceding year.

In the United States, every thing that has been done hitherto in the conſtruction of cities, is in imitation of the old European and African mode, and of courſe is *wrong.*

The ancient conſtruction of London coſt that city nearly *two hundred thouſand* lives in one century; and Cairo and Conſtantinople probably loſe more than that number, every half century. I firmly believe, and my belief is founded on the uniform operation of eſtabliſhed laws of nature, that a *perſeverence in our preſent mode of building cities, will doom them all to the ſame fate.* I believe it, becauſe I ſee no poſſible reaſon why peſtilential diſeaſes ſhould not be as frequent and as fatal in America as in the old world, under the operation of ſimilar local cauſes.

If a rigid police can be uniformly obſerved; and every poſſible nuiſance be removed by ſhovels, brooms and water, cities in healthy poſitions, will eſcape the regular and conſtant return of malignant epidemics.—Multitudes of lives may be ſaved, and the loſs of buſineſs prevented, by theſe means; and in cities already built, cleanſing, waſhing and purifying, are the guardian angels of public health.

But I maintain that this is not exterminating the root of the evil. Cities *may* be built ſo as to unite all the utility of a town, with the ſalubrity and pleaſures of the country, and in this new world, where men are as free to act as to think, it will be diſhonorable not to invent and execute a plan for theſe purpoſes.

Were I called upon for a plan of a city, which ſhould combine in it the advantages of town and country, I ſhould ſuggeſt the following as the outline:

1. The poſition to be on the ſhore of the ſea or the bank of a river, gently aſcending with an angle of at leaſt fifteen or twenty degrees; which would form a declivity for a rapid deſcent of water to waſh the city; at the ſame time, would not prevent the draft of heavy loads from the river or ocean.

2. The wharves on the water ſhould be extended beyond low water mark, that no part of the docks ſhould be left bare by the receſs of the tide. All the ſolid front of the wharves ſhould be on a line; that no eddies might be formed; and the water might flow in a paſſing current. This would carry off ſubſtances thrown into the water, and contribute to keep the air pure by motion and change. Should it be neceſſary to extend wharfing in one place further than in another, it ſhould be in the form of a bridge on piers.

3. The warehouſes on the wharves ſhould not be jumbled together in a chaos; one projecting in front of another: but built in a ſtrait range, at a ſuitable diſtance from the water; and an alley ſhould paſs between them for the admiſſion of freſh air on every ſide. No wet cellars ſhould be permitted.

4. The ſtreets ſhould be ſtrait, interſecting each other at right angles, and forming the city into ſquares of at leaſt 500 feet on a ſide.

5. The lots ſhould be at leaſt 60 feet wide, and 250 feet long. No more than 35 or at moſt 40 feet of the breadth of the lot to be ever covered with buildings, ſo that a ſpace of 20 or 25 feet ſhould intervene between the houſes. This ſpace would leave a cartway, give free admiſſion to air, and reduce the riſk of fire 75 per cent.

6. In the rear of the front building, out-houſes might cover 100 feet of the length of the lot. The remaining 150 feet ſhould be laid out to the fancy of the owner in a garden—the police interfering no farther than to require by law that ſome kind of trees or vegetables ſhould occupy the ſpace—vegetation being the natural purifier of the air.

7. Directly thro the center of each ſquare, ſhould run a narrow ſtreet of about 25 feet taken out of the rear of the lots, which ſtreet or alley ſhould never be built on, but would admit a paſſage for citizens thro the ſquares; and what would be ſtill more neceſſary and uſeful, would admit duſt-carts to take up all the filth of the houſes, from the rear, and prevent that intolerable nuiſance, the depoſiting of offenſive materials in the ſtreets. The little flower gardens and ſhady lawns in theſe ſquares, would preſerve the air pure, freſh and cool in ſummer—they would occupy many perſons of delicate health, thus contributing to their comfort, diverting their minds, and in many caſes, reſtoring them to health. Here alſo children would find room to gambol, without endangering their lives or annoying paſſengers in the ſtreets; and here the young of both ſexes would acquire a taſte for gardening, for botany, and the delightful amuſement of ſtudying the works of nature.

8. The ſtreets ſhould be one hundred feet in breadth, and

planted with three rows of trees. One row on each ſide next the foot walks, and a row in the center. The foot walks to be 15 feet wide. The trees next the walks would then be 15 feet from the houſes; and a ſpace between the center row and each ſide row, of 35 feet. The trees might be ſo pruned, as to prevent their injuring the buildings, and their diſtance would prevent their interfering with fire engines. Theſe trees would be leafleſs in winter, when the ſun is acceptable; and in ſummer would ſweeten, purify and cool the air. The citizens at all times in the day, would walk in a refreſhing ſhade—the center row of trees would furniſh ſhade for horſes.

9. No city ſhould be raiſed on level earth. If a natural poſition cannot be found, with a general declivity to the water, the ſtreets ſhould be thrown into artificial elevations of at leaſt 3 feet in every hundred—five feet in the hundred would be better. This would give celerity to the water falling in ſhowers, and wonderfully aſſiſt in removing filthy ſubſtances from the ſtreets; for after all human efforts in ſweeping, much offenſive matter will remain, which water alone will reach and carry off.

10. No pains ſhould be ſpared to ſupply a city with freſh running water.

It is a point of infinite importance that citizens ſhould not depend on water from pumps in the city. In a few years, the ſubterranean water becomes impregnated with the noxious particles from vaults—and this evil continues to increaſe with the age of the city. One of two remedies are to be provided—either the city muſt be ſupplied with freſh water by pipes from a diſtant ſource; or the vaults muſt be ſo formed as to be capable of being opened in winter and cleanſed. But the laſt method, tho uſeful and practiſed in ſome European cities, would be ineffectual.

The back houſes in a city are, in many reſpects, a terrible nuiſance. If a ſewer could be carried four or five feet under ground, and every ſuch houſe be ſet over it, a ſtream of water paſſing thro it from a diſtant ſource, would be an excellent means of cleanſing a city from this ſource of diſeaſe. But ſuch ſtreams of water are rarely to be obtained.

Another expedient ſuggeſts itſelf for the ſame purpoſe. Let a ſewer of three feet wide and well paved, be run in a ſtrait line under the rear of the lots, and all back houſes ſet over it. In ſuitable places, let channels be made to turn the water from the ſtreets into the ſewers, in long or violent ſhowers, when the water is not wanted to waſh the ſtreets. In this manner, the ſewers might be waſhed perfectly clean, a number of times every ſummer, and the citizens preſerved from their poiſonous exhalations.

On a model of this kind, I conceive cities ſhould be conſtructed in the *moſt healthy* ſituations ; for a crouded population, in any place on earth, will leſſen the ſalubrity of the air. Cloſe compact cities, in any quarter of the globe, are the graves of men. All the great cities of Europe require annually ſome thouſands of ſtrangers to ſupply their waſte of population. Yet there is no neceſſity for men to croud together in ſuch a compact form. There is land enough on earth to ſuffer any extenſion of cities, and it makes little difference, in the firſt inſtance, whether a lot contains one hundred feet of land or half an acre. Nor would a leſs denſe population be any inconvenience to men in buſineſs. They might be obliged to walk further on ſome occaſions ; but in the cool ſhade of my propoſed city, this would be a pleaſure rather than a toil.

It is wrong, it is criminal, for legiſlatures to permit ſuch crouded population. It is a nuiſance, not only to cities, but to the public. It is a truth, that numbers of lives are ſacrificed almoſt every year, among worthy country gentlemen, who have buſineſs in our large cities.

They come to town in the hot ſeaſon, when no uncommon diſeaſe prevails among the citizens who are innured to the air—they come without ſuſpicion—they are ſeized with fever and die. The air of the low grounds in our cities, even in healthy ſeaſons, is often poiſon to people from the country, and gives them a fever, when no epidemic is viſible among citizens. I know the fact, and it is a ſerious calamity, eſpecially to ſeamen. The low grounds in Providence, New-York, Baltimore, &c. are great nuiſances. The building of Water-ſtreet and Front-ſtreet in New-York, it is believed by good judges, has coſt this city a thouſand lives in five or ſix years. I ſay nothing of Philadelphia ; for its poſition and the alterations in the original plan of the city have doomed it to calamity. The citizens will not believe the evil to ariſe among themſelves and therefore muſt be left to their fate. If remitting fevers *every* year, and yellow fever *often*, will not convince men that ſomething is wrong in *their* city, it is in vain to reaſon with them. Of one thing I am confident, that if all the earth in New-York on which Water and Front-ſtreets are built, could be ſunk 30 feet under water without loſs of lives, and the proprietors indemnified by the citizens, it would be the greateſt bleſſing which heaven could in mercy beſtow on the city and the ſtate. I believe alſo, that if all the croſs ſtreets and the back houſes in Philadelphia could be levelled with the earth, and the ground converted into flower gardens and graſs plats, the citizens would, in twenty years, celebrate the anniverſary of their deſtruction, with as much fervor as the republicans in France celebrate the demolition of the Baſtile.

It is not poſſible, I ſpeak it with zeal and confidence; it is not poſſible, under the operation of the *preſent* laws of nature, for men to be healthy in many of our cities, during the heat of ſummer. That open champaign country, which regularly produces intermitting and remitting fevers, will, when planted with populous cities, often produce the plague. Of that country, there is an extent in the United States, of more than one thouſand miles in length, and from 40 to 60 in breadth.

All the ſhore of the Atlantic from the Hudſon north-eaſtward will admit of healthy cities. If the commercial towns on that portion of America were conſtructed on the foregoing plan, I would anſwer for it, that they would never be ravaged with yellow fever. Individual caſes might occur; but the diſeaſe could not, without a miracle, become epidemic. But as our towns are now built they will at times be partially affected. In *ordinary* ſeaſons and with a vigilant police they will eſcape, with the yearly loſs of only ten, fifteen or perhaps fifty citizens, the unfortunate victims of the negligence, the folly, and the crouded population of cities. In very *unfavorable ſeaſons*, the number of victims will be *increaſed. Such is the fate of our northern cities.*

But the deſtiny of cities on the ſouthern Atlantic ſhore, is to be more ſevere.

The period of general contagion may ſubſide, and intervals of more general public health, may be expected. The moſt unhealthy parts of the earth enjoy ſuch intervals, when the rage of malignant complaints is ſuſpended. But the melancholy periods of epidemics will often recur—and as the plague, in all its ſhapes, is the offspring of *cauſes*, mankind, wherever thoſe cauſes exiſt, are deſtined to be afflicted.

Away then with crouded cities—the 30 feet lots and alleys—the artificial reſervoirs of filth—the hot beds of atmoſpheric poiſon. Such are our cities—they are great priſons, built with immenſe labor to breed infection and hurry mankind prematurely to the grave.

There is no neceſſity for this deſtruction of human life. Cities laid out on my plan would unite all the pleaſures of country villages, rural ſeats, and commercial towns. The merchant, in his ordinary buſineſs, would enjoy the grateful ſhade of oaks and elms, with the luxuriant perfumes of odoriferous flowers. At the ſame time, this verdant city would ſuperſede the uſe of ſolitary country-ſeats in ſummer; and thus ſave the expenſe now incurred of poſſeſſing a town and country houſe. The country ſeat of a merchant, is a tax of ten, fifteen or twenty thouſand dollars, paid to maintain the poiſon and peſtilence of our preſent cities.

It is remarked by Boyle and other authors that China is rarely affected with the plague. The peſtilence of 1347 is ſaid to have commenced in that country; but it ſeems to be agreed that China and ſome other Aſiatic countries are not often affected. This fact, if juſt, deſerves inveſtigation; in particular ought philoſophers to examin the nature and properties of the ſoil and the mineral productions.

China is a very populous country, filled with canals, and well cultivated. It is probable that the water in the canals is never ſtagnant, nor filled with vegetables—it is probable that the face of the country has been completely dried by cultivation, all ſwamps and moiſt grounds drained and covered with corn, rice and graſs. How much theſe improvements have contributed to preſerve its inhabitants from peſtilence, I need not inform my readers.

The cities alſo in China are vaſtly large and populous ; and an enquiry will ariſe, how thoſe cities eſcape the plague, if great population contributes ſo much to the calamity.

I anſwer, they do not eſcape all plagues—ſome of the moſt violent have ravaged China ; but they probably eſcape the ſlighter plagues, which are the moſt frequent ; and this is all that mankind can expect.

We are not ſufficiently acquainted with the ſoil, climate, police and manners of China, to ſpeak with certainty on this ſubject ; but one fact ought to be mentioned. The Chineſe houſes have no windows in front, on the ſtreet, but in the rear, are ſpacious gardens filled with trees, vegetables, flowers, and freſh ſtreams of water. Here the family is regaled and amuſed ; the air is rendered pure by cultivation, cleanlineſs, and the particles exhaled from growing plants, and water-falls. This arrangement alone will account for their exemption from the uſual diſeaſes of hot climates.—When the Americans, with their boaſted light and ſcience, ſhall become as *wiſe* as the Chineſe, they may expect to ſhare in the exemption.

It is a fact related by Ruſſel and others, that in the midſt of the Turkiſh cities, during a deſolating plague, the ſpacious manſions of the wealthy Turks, which are kept clean, and well aired, often eſcape the diſeaſe.

I cannot leave this deeply intereſting ſubject, without relating an anecdote from antiquity, which ſhows in what light wiſe men formerly viewed it.

In Greece, the countries of Attica and Lacedemon, conſiſt of dry, gravelly or rocky land ; and I can find but one inſtance, in which thoſe countries were affected by peſtilence, in the early ages. It is evident from Thucydides, that the plague had never been known in Athens before his time, ſince the date of the earlieſt traditions ; and then it was probably induced principally by the croud of people collected in the ſiege, to eſcape the ravages of the Lacedemonians.

Bœotia, on the contrary, was more frequently viſited by peſtilence. To account for this, let us know what was the ſituation of this country. It is thus deſcribed.

Bœotia may be conſidered as a large baſon, ſurrounded by mountains, the different chains of which are connected by high grounds. Moſt of the rivers from theſe hills unite in Lake Copais, of fourteen leagues circumference, which has no apparent outlet ; but, it was alleged by the ancients, to have ſubterranean paſſages into the ſea. The country is not without hills, but is moſtly level, and very fruitful. The air in Attica is remarkably pure ; but in Bœotia, very denſe ; hence the ancients derived the heavy, phlegmatic character of its inhabitants from the air. This country ſeems to have been to Attica, what Holland now is to France.

See Travels of Anacharſis, Ch. 34 and the authorities there cited.

From ſeveral paſſages of hiſtory, it appears that Bœotia was more frequently viſited by peſtilence than Attica. This we ſhould expect from the difference of their ſituations.

Juſtin, lib. 16. ca. 3. informs us, that the Bœotians once conſulted the Delphic Oracle, how to remedy the plague that troubled them. The Oracle replied, "That they muſt plant a colony in the country of Pontus, ſacred to Hercules." But they were ſo much attached to their own country, that they diſobeyed the injunction ; until another calamity, war, drove them to conſult the Oracle a ſecond time, when, receiving a ſimilar anſwer, a part of the people removed to the borders of the Euxine, and founded the famous city of Heraclea.

This Oracle certainly underſtood the cauſe of the evil, and directed to a ſuitable remedy. The anſwer implies, "you muſt thin your population," or "you muſt ſeek a more ſalubrious climate," or it might comprehend both theſe ideas. The direction is full of wiſdom, and is ſtrictly applicable to many of our American cities. Tranſlated into the language of our circumſtances, it runs thus "thin your population, by ſpreading your citizens over a larger extent of ground, or you will often be driven from your cities, into the country."

We have Moſes and the prophets, in books and experience, and if we will not liſten to them, neither the Delphic Oracle, nor a meſſenger from the thouſands of dead who have periſhed by the plagues of our cities, would induce belief or effect a reformation.

SECTION XVIII.

Of the diſappearance of the plague in ſome parts of Europe, and of new diſeaſes.

IT is a common remark that no plague has appeared in England, ſince the year 1665, and that the diſorder has ceaſed in the weſt of Europe, for near a century paſt. This happy exemption from that horrible calamity has been aſcribed to various cauſes. Many people aſcribe it to health laws—a ſubject that has been already diſcuſſed. Some allege that the uſe of foſſil coal has baniſhed the plague from London; and Hoffman relates that Halle in Germany, which uſed to be afflicted with malignant fevers, has been free from them ſince coal has been uſed as fuel. Others ſuppoſe that the great improvements in building and in the modes of living, in modern times, have been the means of preventing the return of peſtilence.

On the firſt cauſe, I have already given my opinion, and the reaſons on which it is founded. I find no ſufficient evidence that health laws ever ſaved a country or city from peſtilence, in a ſingle inſtance; but abundant poſitive proof of their utter inefficacy, in a great number of caſes.

With reſpect to the uſe of coal, we ought not to indulge very ſanguine expectations. It may be true, that violent diſeaſes became more rare or wholly diſappeared, in ſome places, about the time that coal became of general uſe as fuel. But let us examin facts, and not truſt to general curſory obſervations.

The digging of coal at New-Caſtle for fuel commenced as early as the year 1234, as appears by a charter of Henry III. and how much earlier, is not known. It was uſed in London as early as 1379, in conſiderable quantities; but when firſt introduced, does not appear. In 1550, coal was in common uſe in London—its price "twelve ſhillings a load." The price in 1590 was raiſed to "nine ſhillings a chaldron," which was deemed exorbitant. Thus far we have little light on the ſubject; but in 1615, the coal trade occupied four hundred ſhips; *two hundred* of which were employed between London and New-Caſtle. The preſent number is *five hundred*, and London contains more than double the inhabitants it did at that time.

See Anderſon's Com. vol. 1. and Fleetwood's Chron.

In 1615 then the uſe of coal muſt have been general in London, and for ſome time before, for the growth of the trade muſt have been gradual. But for fifty years after this general uſe of coal, London was afflicted by the plague; the city indeed was rarely free from it, as appears by the bills of mortality, and three times, after that period, the city was ravaged by that diſtemper, as an epidemic, viz. in 1625, 1636 and 1665.

So far we have no encouragement to hope for a prevention of the plague by the uſe of coal. With reſpect to the city of Halle, I can ſay nothing. The obſervation of Hoffman may be juſt, and yet coal may have had no influence in checking the prevalence of peſtilence.

It belongs to phyſicians to aſcertain the effect of the vapor from this foſſil ſubſtance on human health. Certain it is, that it occaſions inconveniences to thoſe who are not accuſtomed to it. So general was the prejudice againſt it, when firſt uſed in London, that in the year 1400, the nobility and citizens petitioned the king "to prohibit the further uſe of ſo noxious and unhealthy a kind of fuel." And. Com. vol. 6. Ap. 935. There is reaſon to believe it is not very unhealthy, but I ſee no ground to ſuppoſe it has had the leaſt influence in arreſting the progreſs, or preventing the return of the plague.

To confirm this opinion, I would mention that the plague diſappeared in France and other parts of Europe, about the time it did in England; in Paris, for inſtance, where no coal is uſed. In a great part of Europe therefore the ſame effect has taken place, without the ſuppoſed cauſe; which leaves us at liberty to reject that cauſe.

The third reaſon aſſigned for the ceſſation of the plague, viz.

improvements in building houſes and cities, and in clothing, diet, the uſe of freſh water and the like, is a juſt one; and there can be no rational doubt that theſe alterations have contributed to mitigate the violence and reſtrain the progreſs, of many acute diſeaſes. Peſtilential epidemics are probably leſs frequent within the laſt century, at leaſt in the more civilized and commercial parts of Europe, and alſo in America, than they had been in former periods.

The poverty, the filth, the dirty, crouded mud cottages, and the ſcanty ſupply of wholeſome food, which was the common fare of the peaſantry, in Europe, muſt have given origin or currency to many diſeaſes; and greatly aggravated their ſeverity. A ſample of this may be ſeen in the early appearance of mortal diſeaſes in the low narrow ſtreets and ſmall crouded apartments now occupied by the poorer people in our cities, and the difficulty of expelling a peſtilential diſeaſe from ſuch places.*

As a general remark it may be alleged with great probability that Europe has derived no ſmall benefit, in regard to public health, from the following circumſtances.

Firſt. From the modern improvements in agriculture, by which means many places are dried and ſweetened, which uſed to be cold, damp and fetid.

Agriculture not only removes, from the earth, ſubſtances poſitively noxious to health; but covers its ſurface with growing vegetables poſitively ſalubrious. This is one inſtance of multitudes, in the economy of the world, in which the happineſs, comfort and intereſt of man are made to depend on his induſtry.

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* The following extracts will ſhow the ſtate of cities and of manners, at the periods mentioned.

"Weſtminſter and London were once above a mile aſunder. The union with Scotland in 1603, did not a little conduce to make a union of London and Weſtminſter; for the Scots greatly multiplying here, *neſted themſelves about the court*; ſo that the ſtrand from the *mud walls* and *thatched houſes*, acquired that perfection of buildings it now poſſeſſes."

And. Com. vol. 2. 285. *from Howel.*

Voltaire ſays, about the year 1500, "Induſtry had not yet changed thoſe *huts of wood* and *plaſter*, of which Paris was compoſed, into ſumptuous palaces London was ſtill worſe built, and peers of the realm carried their wives behind them on horſe-back."

In 1504, when James IV. of Scotland was married to Margaret, daughter of Henry VII. of England, the princeſs made her public entry into Edinburgh, riding behind King James on a pillion.

Henry's Hiſt. Britain, vol. 6. 597.

This *princely* cuſtom is ſtill preſerved in New-England; where the common farmers live in better houſes than many of the nobles, at the period above named.

See Dr. Ruſh's Works, vol. 1. p. 25.

Secondly. Improvements in building houſes may have contributed to the ſame ſalutaray end. The materials are of a kind leſs ſuſceptible of accumulating and retaining infectious exhalations, than formerly—the apartments are more ſpacious, elevated and airy.

Thirdly. Houſes are leſs crouded than in ancient times, as appears by the proclamation of Queen Elizabeth, recited in the foregoing hiſtory. In London, one perſon, ſince the fire of 1666, is ſuppoſed to occupy as much ſpace as two in the old city. This remark applies eſpecially to the poor, who were formerly more numerous than at preſent. Some of the nobles, in the old city, had ſpacious gardens, but the maſs of people were miſerably poor and crouded into narrow filthy lodgings.

Fourthly. There is probably an immenſe difference in regard to general cleanlineſs, between the people even of the ſixteenth century, and the preſent age. For this we are partly indebted to commerce, the ſource of wealth and refinement. A more general uſe of linen and cotton in cloathing, articles which require waſhing frequently, may have contributed to the ſame object.

Fifthly. The introduction of pure water into cities from diſtant ſources, and a liberal uſe of it, in houſes, and the ſtreets, have aided in the ſame ſalutary work of diminiſhing the calamities of diſeaſe.

Sixthly. It is believed that the modern diet is more friendly to health than that of former times. It is evident that to this change Europe is much indebted for the diſappearance of ſcorbutic complaints, which formerly were epidemic in Holland and other parts, and which ſtill prevail in Iceland and Canada, where the poor live moſtly on dried or ſalted fiſh, poor fleſh meats, with a ſmall portion of vegetables. The cultivation of the vine and the orchard has doubtleſs had a conſiderable effect. Cider and wine have aſſiſted in preſerving the body from debility in certain peſtilential periods; and when temperately uſed, are of excellent uſe.

But I apprehend that the moderns have aſcribed too much to theſe cauſes. Any man who will read hiſtory with care, will obſerve that there has been, within about a century, a conſiderable abatement of peſtilence in all parts of the world. The plague is far leſs deſtructive in the Levant, and Egypt, within 150 years, than it was in former ages. This mitigation has been cotemporary in all parts of the earth, of which we have any correct knowledge. The cauſe of this change, I pretend not to aſſign ; but a ſimilar abatement has been obſerved in the violence of earthquakes.

While I admit however that the true plague has diſappeared as an epidemic in many parts of Europe, I do not admit that *peſtilence*, in the general ſenſe of the word, has wholly diſappeared. If the true plague, technically ſo called, ſhould never again occur in London or Paris, I ſhould then ſay, that improvements in modern times may have *mitigated the peſtilence*, but not that they have wholly baniſhed it. Under this word peſtilence, I include ſmall-pox, anginas and petechial fever, with other malignant diſorders, which evidently depend on the ſame general cauſe as the real plague, operating with leſs force. Theſe diſeaſes ſtill appear in all parts of Europe, and exhibit the *exiſtence of the peſtilential principle*, altho improvements may have *leſſened* and *circumſcribed* its effects.

I do not however conſider it as certain that the true plague will not reviſit all the weſtern parts of Europe. A concurrence of cauſes, like that in 1348, might again produce that diſeaſe in France, England and Ireland, with all its horrors. But the probability is, that the modern improvements have removed ſo many of the *local cauſes* of diſeaſe, that no conſtitution of air will ever again produce the ſame mortality, as that under Vortigern or that under Edward III ; nor will the plague ever again be ſo frequent, as in former ages.

On this point however there is not ſufficient ground to build any certain calculations, for the following reaſons. Every phyſician and hiſtorian well knows that there have been frequent revolutions or changes in the form of certain diſeaſes—ordinary diſeaſes with new ſymptoms, and diſeaſes before unknown, have appeared in various countries and in all periods.

The moſt remarkable of theſe are the ſmall-pox, venereal diſeaſe, ſweating ſickneſs, Hungarian fever, petechial fever and angina maligna, with ſome of leſs note.

I am not about to enter on the great queſtion, when or how particular diſeaſes have been introduced or modified in their ſymptoms. I ſuſpect however there is a fallacy in the common theory about *new* diſeaſes. What are uſually called *new* are more probably nothing more than the changes that are made in former diſeaſes, by alterations in the atmoſphere, climate, habits of living and a multitude of inferior cauſes. The ſmall-pox and the venereal diſeaſe ſeem to have the beſt claim to the appellation of *new* ; yet the fact of their being unknown before the periods aſſigned for their appearance, has been juſtly called in queſtion. See *note* at the end of this Section.

Certain diſeaſes however appear in particular countries, where they had not before been known, ſince the date of the earlieſt hiſtories. Poſſibly ſome have been propagated by infection ; others have evidently ariſen from ſome general cauſe. Thus Pliny relates that the eliphantiaſis was brought from Egypt into Italy, by Pompey's troops, but ſoon diſappeared. It is ſaid alſo that the ſame diſeaſe was propagated in the weſt of Europe by the Cruſaders. Epidemic ſcurvy appeared in the maritime parts of Holland in 1556. The petechial fever which deſolated Spain in 1557, and afterwards all Europe, was called a *new* diſeaſe, different from the uſual purple fever, and ſaid to be ſpread from the iſlands of the Levant through Italy to the weſt of Europe. The angina maligna, in Spain in 1610, was called there a *new* diſeaſe ; and in England, where it appeared about fifty years ago, it has been called a new diſeaſe in that country.

But the real ſtate of the queſtion ſeems to be, that epidemic diſeaſes, moſt or all of which proceed from qualities of the atmoſphere, ſuffer general changes, in conformity with the revolutions and alterations which take place in the phyſical world. A remarkable inſtance of this, was the ſudor anglicus, which was, in its general ſymptoms, the plague ; but ſome general cauſe in England firſt and afterwards on the continent, ſuperadded a peculiar ſymptom, that of profuſe diſcharges by the pores. This character of the diſeaſe, as has been well obſerved by the author of Traité de la peſte, was the effect of a ſpecies of revolution in the form of peſtilence. Infection or contagion can have had no concern in producing this phenomenon. The diſeaſe maintained this peculiar character from 1483 to 1551, a period of almoſt 70 years, raging occaſionally in moſt parts of Europe and then diſappeared ; at leaſt it has never made conſiderable ravages ſince that time.

This, in medical language, was a *new* diſeaſe, as demanding new modes of treatment ; but in the language of philoſophy, it was only a varied form of the ſame malady, and proceeding from a common cauſe, with the inguinal plague, but that cauſe in particular times and places, was modified in its operation. What confirms this idea is, that this ſweating diſeaſe never appeared as an iſolated epidemic, but was always cotemporary with the common plague in other countries—that is, it formed a part of the general effects of the peſtilential principle. Thus in 1483, about the time of its firſt occurrence in England, all Europe was deſolated by the common plague. Denmark loſt half its inhabitants, and many other countries fared very little better. The ſame may be obſerved of its ſubſequent returns, and of its prevalence in Ireland, Holland, France and Germany.

This is what I call a revolution in peſtilence, and it will apply to many other changes in the predominant diſeaſes of the human race.*

Thus the petechial fever, which ravaged Europe in the ſixteenth century was called a *new* diſeaſe ; but I conceive it to have been no more than a varied ſorm of the common purple fever, induced by ſome general variation in the elemental cauſe of epidemics, or by the ſeaſons. It formed a part of the peſtilential ſeries, and was the precurſor of the plague, as it is to this day, altho it has rarely been ſo general or fatal as about the year 1556 and from 1570 to 1576.

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* It aſtoniſhes me to read in modern books the poſitive aſſertions, " that the plague is never generated in Great-Britain, or other northern latitudes." See Mead, James' Medical Dictionary, Cullen, Encyclopedia and other original works and compilations without number. Lord Verulam, Sir Thomas Moore, Boyle, Eraſmus, Diemerbroeck and other luminaries of former centuries, who ſaw the plague frequently in all its varieties, never pretended that the diſeaſe was not produced in their reſpective countries. The ſudor anglicus, not only appeared *firſt* in England, but for the firſt time of its prevalence was confined to Engliſhmen. Yet this was the moſt violent and deſtructive form of the plague that ever has been known.

" Nuper novum peſtilentiæ genus immiſit Deus, letiferum ſudorem, quod *a Britannis exortum*, incredibili celeritate, per orbem longe lateque divagatum eſt—plurium exitio, ſummo terrore omnium."

Life of Eraſmus, 347.

How reſpectable writers can overlook ſuch authorities is to me inexplicable.

It is remarkable alſo that the general cauſe extended over the Atlantic, and gave the ſame character to the fevers of the Weſt-Indies. The diſeaſe which reduced the forces of Sir Francis Drake at Carthagena, in 1586, was called *calenture ;* a ſpecies of malignant ſpotted fever.

Purchas, vol. 4. 1182.

A ſimilar fever infected the people under Sir Thomas Gates, bound to Virginia, in the beginning of the laſt century. And if Ulloa is correct in ſtating that the infectious yellow fever never appeared at Carthagena, till about the year 1730, we have a remarkable proof of a revolution in the diſeaſes of that climate. We are to conclude from the facts, that the calenture was a diſtinct form of the peſtilence incident to the country, till the beginning of the preſent century; ſince which, it has aſſumed the character of our bilious plague. I am however inclined to queſtion the fact. The true yellow fever has been known in the Engliſh iſlands from their firſt ſettlement. It reduced Cromwell's forces when they took Jamaica in 1655.

It is further to be obſerved that the true form of plague is never known in Spaniſh America. But at Quito, and other places, malignant diſtempers under the name of *ſpotted* fevers, and pleuriſies, ſweep away prodigious numbers of people and fall but little ſhort of the inguinal plague.

Ulloa, vol. 1. 279—281.

Such then is the peſtilence of South-America ; but in other periods, it may take a different form.

Theſe obſervations alſo lead to an explanation of the phenomena of the angina maligna. It was called a *new* diſeaſe in Spain and England, when it firſt appeared in 1610 ; but this is a miſtake. It is evidently deſcribed as epidemic a century or two before thoſe periods. But the truth is, *that form* of peſtilence had diſappeared for a long period and given way to ſome other diſeaſe. After a time, it re-appeared, perhaps with ſome new ſymptoms.

The ſame remarks apply to the Hungarian fever, the peculiar ſymptoms of which firſt occurred in the ſixteenth century; and to a multitude of local and temporary epidemics, which have been called, on account of ſome ſingular ſymptoms, *new* diſeaſes.

Theſe facts ſerve to explain my idea of the diſappearance of the plague in certain parts of Europe. I conſider the angina maligna as peſtilence of the worſt kind; and its occurrence in modern times, ſince the glandular plague is leſs frequent, may be only one of the revolutions in diſeaſes of a malignant type, which have marked other periods. The deſtructive force of the peſtilential principle, falls principally upon the throat, inſtead of the brain or the glands, and moſtly upon youth. This may be the principal form of peſtilence for a century or two, when it may diſappear and give way to the common plague, or to ſome new combination of ſymptoms, which ſhall paſs for a *new* diſeaſe. A conjecture of this kind is authorized by ſeveral changes in the general characters of diſeaſes, at particular periods of the world. I do not therefore conſider it to be *certain*, that the parts of Europe, which have eſcaped the plague for a century, are ſecure of permanent exemption from that calamity.

This conjecture ſeems to be authorized by the evident mitigation of the plague in the Levant, within a century. Plagues, it has been before obſerved, are obviouſly leſs frequent and leſs ſevere, in Egypt and Turkey, than they were in former ages. This remark I believe to be new, but it is a fact; and this mitigation correſponds in time with the diſappearance of the diſeaſe in the healthy parts of Europe. From this circumſtance, I conclude that this change is the effect of ſome general cauſe, in the ſtate of the elements.

This opinion may derive great ſtrength, from revolutions or changes in the natural world, analagous to that in the character of epidemic diſeaſes.

It is generally ſuppoſed by philoſophers, that earthquakes are leſs frequent and violent, in modern days, that in the firſt centuries after the Chriſtian era, and the imperfect ſurvey I have taken of their hiſtory, gives me reaſon to believe the opinion well founded.

The eruption of volcanoes is very often ſuſpended for a long period. Etna was quiet about forty-five years, at the beginning of the preſent century. The volcanic mountain in Teneriffe, which had been quiet ever ſince the year 1704, again diſcharged its fires in Auguſt laſt—after a ſuſpenſion of ninety-four years. There are other volcanic mountains that have ſlumbered for many centuries, as Lipari, near Sicily.

The aurora borealis has its revolutions. Sometimes it diſappears for half a century or more ; then returns, and frequently illuminates the heavens.

The ſeaſons, on a ſmaller ſcale, manifeſt analagous revolutions. At certain periods, we have mild winters ; very little froſt and ſnow, with ſoutherly winds, for a ſeries of years. Then we have a number of long, ſeverely cold winters in ſucceſſion, with violent tempeſts, deep ſnow, and perpetual north weſterly winds. No leſs various are our ſummers, as to heat and moiſture.

The vegetable kingdom exhibits ſimilar changes, for which no viſible cauſe can be aſſigned. When our anceſtors firſt ſettled Maſſachuſetts, they raiſed wheat on the eaſtern coaſt, in the counties of Plymouth, Middleſex and Eſſex ; but in the year 1664 mildew appeared for the firſt time to injure that uſeful article, and ſince that time, it has not been poſſible to raiſe wheat, within a conſiderable diſtance from the ſea ſhore.

It is related by the French that wheat had not been known to mildew in France, until the year 1550.

Van Helmont, p. 1093.

In 1770, the potatoe plant, in a particular part of Scotland, was attacked by a diſeaſe which was *new ;* and it has ſince been ſpreading. A ſimilar fact is related of the oats in ſome parts of the ſame country, in 1775. Theſe diſeaſes, for they are really ſuch among vegetables, are *new*, and as far as they extend, they are a ſerious calamity. They are the peſtilences incident to vegetable life ; which, like diſeaſes among men, ſpring up and diſappear, without any certain cauſes which are within our comprehenſion. It is cuſtomary to aſcribe ſuch phenomena to the *ſeaſons;* but it would be difficult to find any *viſible* or *comprehenſible* qualities in the particular ſeaſons, producing ſuch diſeaſes among vegetables, which had not characterized innumerable ſeaſons in former years, which produced *no* ſuch effects.

The death of prim and black thorn in our country, is a ſimilar phenomenon.

Sometimes a new ſpecies of tree will ſpring up ſpontaneouſly and gradually ſpread, where none ever grew before. The pine has thus introduced itſelf into Duxborough in Maſſachuſetts, within the preſent century. Not twenty years ago, a man was living there who remembered the firſt white pine that ever grew in that town: but now one eighth part of the woodland is covered with it.

Hiſt. Col. vol. 2. 5.

The animal world diſplays ſimilar changes and revolutions. We obſerve, not only uncommon numbers of common inſects or ſmall animals, in particular years, for which we can aſſign no ſpecific cauſe; but we actually ſee certain new ſpecies of inſects, and at times, known inſects grow to an uncommon ſize. Inſtances of the latter phenomenon have occurred in the locuſts, in the frog-kind, and in flies. The flies about Plymouth in 1633, and about New-London, the laſt ſummer, are deſcribed, as being not only diſtinguiſhable for their numbers, but for their ſize. Ancient authors have remarked the ſame phenomenon.

The millions of worms which ſpread over many hundred miles of territory in America in 1770, can no more be accounted for, than the ſudor Anglicus, or any other new form of diſeaſe.

The inſect, which about twenty years ago, firſt appeared among the wheat, on Staten-Iſland, and which has continued to multiply, and eſſentially injure the crops, over a great extent of country, is unqueſtionably a non-deſcript as to America; a new form of animal life. Men are ever fond of propagating conjectures and vulgar tales for truth. The idle ſtory which imported this inſect from Germany, and gave it the name of Heſſian fly, has been proved, by careful enquiries, to be mere conjecture; no ſuch animal being known in Germany. Yet it has laid the foundation of a durable error in natural hiſtory. So fond are mankind of this vulgar prejudice, of imputing all their evils to others, that even inſects muſt, like plague, be imported !

This inſect is doubtleſs a new ſpecies of animal ; it is one of thoſe varieties which nature is continually exhibiting, in the immenſity of her operations ; it is a diſtemper incident to that particular plant, and others perhaps in a leſs degree, which, like the ſudor anglicus may endure for half a century, and then diſappear; or it may be derived, from permanent cauſes, and deſtined, for a longer time, to annoy that ſpecies of vegetable life, like the mildew on the ſame plant, on the maritime borders of Maſſachuſetts and New-Hampſhire. The mammoth of Siberia and America, whoſe enormous bones are ſeen in our muſeums, and whoſe race is ſuppoſed to be extinct, may be another inſtance of perpetual revolution in the works of nature.

The lofty pine, the glory of the foreſt, covers immenſe tracts of our native wilderneſs ; but when cut down, is not propagated from the roots or ſtump, like moſt other trees. Yet I am told that in Carolina, whenever the lands are cleared of the native woods the young growth conſiſts moſtly of pines, tho far from any of that ſpecies of tree. Similar changes in the ſpecies of trees, are obſerved on the clearing of lands in other parts of America.

So alſo, on clearing our lands, in every part of America, the ſoil is ſoon covered with a full crop of white clover, of ſpontaneous origin.

Theſe productions are uſually aſcribed to the ſeeds of the plant, ſcattered by birds, which lie inert, while covered with ſhade and leaves, and germinate on the acceſs of the ſolar rays. This ſolution is conjectural ; it is, like the importation of the fomes of epidemic diſeaſes, founded on mere ſuppoſition ; it is the reſort of careleſs, ſuperficial obſervers, who will not take the pains to extend their views over the works of nature. Do birds convey the *ſeeds of pine* and of *clover* and ſpread them over hundreds of miles of the wilderneſs ? Have theſe ſeeds been all ſcattered within a few years ? Or will the ſeeds endure the froſt, the rain and the heat of ages, without periſhing or germinating ? Beſides, birds feed on the ſeeds of other graſſes and plants, as well as thoſe of white clover. Why are theſe not ſpead over our woods in the ſame manner ?

The phenomena of the foreſts in America preclude the probability, or rather the poſſibility of ſuch events. The new plants that ſpring up, are generated by new powers in the elements, occaſioned by different combinations of heat, moiſture and air, introduced by the labors of man ; combinations which could not exiſt while the ground was clothed with trees of other ſpecies.

Plants are furniſhed with ſeeds for the purpoſe of propagation. This wiſe proviſion of a beneficent providence, is highly uſeful to man, and to animals which ſubſiſt on the ſeeds. But ſeeds are not neceſſary to the production of plants, in all climates. Every vegetable has ſome ſpot on the globe, where it is indigenous, where it was originally produced without ſeed ; and where it will beſt thrive, and grow to the higheſt ſtate of perfection. Such was the origin of moſt of the plants now known to man. The principles of animal and vegetable life were cotemporary with the formation of the earth. New ſpecies are generated only by thoſe gradual alterations viſible in the operations of nature, or by accidental changes, induced by extrinſic and artificial cauſes.

Animals are alſo produced very often without any parent, but the elements. Hear what is recorded by that accurate obſerver, Dr. Lind, on the diſeaſes of hot climates, p. 208. " It is a phenomenon inconteſtibly true, that in ſtagnating pools of water at Bombay, produced ſolely by the rains, and which have no communication with any river or the ſea, living fiſh are generated ; many perſons have eaten of them. Upon the drying up of the pools, they die and frequently are very offenſive."

I have not the leaſt doubt of this fact ; and it is on this principle only that we can account for the exiſtence of fiſh of various kinds, eels, &c. in brooks and ponds, on the tops of hills, above impaſſible falls ; and in lakes which have no outlet. And we prove the generation of ſuch animals in the places where they exiſt, not only by the impracticability of their finding a paſſage to ſuch ſituations ; but by the fact, that many ſpecies of them are never found in ſalt water, and probably could not exiſt in it.

Any perſon may be convinced of the utter impoſſibility of fiſh's making their way to the heads of many ſmall ſtreams, where they are found, by examining innumerable ſuch ſtreams on our mountains, which are full of trout and other ſmall fiſh, above perpendicular falls among ſolid rocks, of 50 or 100 feet in height.

The truth is, the elements of air and water are fitted to produce animals of the kinds proper to ſubſiſt in them; and ſo are plants. Not a vegetable in the field is found without its worm, its fly or other inſect, which it generates or feeds; and the animal when peculiar to a plant, has the color and the properties of that plant. Not a ſpecies of vegetable or animal matter, expoſed to a ſuitable degree of heat and moiſture, which does not produce its inſect. Even living animals are not an exception. Are not the large worms, formed in the human ſtomach, poſſeſſed of animal life? And are they produced by a germ depoſited by an animal of the ſame kind? Not at all; the ſuppoſition is ridiculous. They are a diſeaſe, cauſed by the operation of heat and moiſture, on ſubſtances in debilitated ſtomachs, which fail to perform the uſual digeſtive functions.* All animals and plants have their diſeaſes; and the mildew on wheat, and the ſcar on vines, are probably the effect of the defective energies of the elements, and a conſequent defective proceſs in the vegetable functions; or of inſects which are the produce of the irregular operations of the elements.

In the year 1788 a horſe was publicly exhibited in Philadelphia, with a living animal, of the worm ſpecies, in his eye. See Muſeum, vol. 3. 500. A worm of three inches in circumference and 20 inches in length was found in the liver of Mrs. Holt of Philadelphia. Ibm. When theſe facts are known and acknowledged, will men ſtill be found to deny the doctrin of equivocal generation? Worms are often generated in the ſmall ulcers on the ſurface of the body produced by peſtilence. Such is the power of excitement.

All creation is full of theſe varieties. Even the ſtellary regions exhibit new ſtars, either ſtationary or revolving, which are viſible for a longer or ſhorter time, and then recede from human view. Other luminous appearances, reſembling a lamp, a ſpear, a beam, are often obſerved, for which we can aſſign no cauſe. The new ſtars may be revolving bodies, which appear to us only in a particular part of their orbits; but other ſingular celeſtial appearances are doubtleſs mere variations in the forms of the element of fire.

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* This is the common theory; ſome perſons ſuppoſe them not a diſeaſe, but a part of the animal economy, neceſſary to full health. This however makes no difference, as to the manner of their production.

The fiſh in the ocean are ſubject to the ſame revolutionary laws. They often abandon the banks where they have appeared for centuries, and appear in places where they were never before known. They are ſubject to epidemic maladies, as much as men or cattle; they often ſicken and die, and ſometimes it appears that the whole ſpecies, frequenting a particular bank, is ſuddenly extinguiſhed.

The changes in the diſeaſes of men; all the phenomena of epidemics, in their origin and diſappearance, their increaſed violence and novelty of ſymptoms, are the effects of ſimilar alterations in the elements which compoſe the ſyſtem. We are but one ſpecies of animals, whoſe bodies are compoſed of the ſame materials, and ſubject to the ſame laws, as the bodies of all other animals. Animal and vegetable ſubſtances are alſo compoſed of the ſame elements, variouſly combined; they are ſimply varieties in the forms of matter endowed with life. And the intellectual endowments of man, with all his boaſted pre-eminence, cannot exempt him from the operation of the general laws which govern every other form or combination of the elements.

Note, On the Venereal Diſeaſe.

I AM really ſurpriſed to obſerve with what pertinacious obſtinacy, men perſiſt, in face of the moſt inconteſtible evidence, upon fathering great evils and calamities on others. The deſcription of Adam's caſting the blame of his ſin on Eve, and Eve's charging the whole to Satan, had it been intended to illuſtrate the practice of tracing diſeaſes to a foreign country, could not have been a more exact repreſentation of the fact, and of the diſpoſition of men to ſhift off, not only crimes, but even moral and political evils, and caſt them on their neighbors. Every nation and every man conjures up a devil, to which all that is *evil* and *diſhonorable* is to be imputed. Pope has well deſcribed this diſpoſition :—

> " No creature owns it in the firſt degree,
> But thinks his neighbor farther gone than he ;
> Even thoſe who dwell beneath its very zone,
> Or never feel the rage or *never own.*"

The people in the north of Europe maintain moſt ſtrenuouſly that the plague never originates in their countries. Mead even affirms that the meaſles, as well as ſmall-pox, had its origin in Egypt.

The inhabitants of Egypt declare that the plague does not originate in *their* country, but is always imported from the north, as Conſtantinople, Smyrna, Greece or Syria ; or from the Barbary coaſt ; and this ſilly notion is actually believed and circulated by moſt reputable travellers. The inhabitants of Conſtantinople, I believe, admit that the plague *may* originate in that city ; but it is believed by many perſons that this diſeaſe does not originate there ; and they trace it to Egypt. Many Europeans have adopted this opinion.

In Smyrna, Syria, Cyprus, and all parts of Europe, the plague is aſcribed to foreign countries. In Algiers, Fez and all along the Barbary coaſt, the plague is held to be imported from Egypt or Conſtantinople : It is immaterial which ; the great point being to ſhift off the origin upon neighbors.

Juſt ſo in America ; it is not admitted by a great portion of people, that the climate can generate a peſtilence. The yellow fever which is the plague of the country, is, in popular opinion, always imported from the Weſt-Indies. When we go to the Weſt-Indies and enquire for the origin of this diſeaſe, we are told very gravely, that it does not originate there ; it comes from Siam and Bulam ; and books are written by able phyſicians to prove the diſeaſe *imported.*

If then we believe the opinion of the inhabitants of any given country, and their *own ſtory* to be juſt, we ſhall prove that the plague and yellow fever are generated in no country on earth.* There is ſomething extremely laughable in theſe facts; but to philoſophy, to medical ſcience and national candor, they are as diſgraceful as they are prejudicial. My enquiry into the hiſtories of theſe diſeaſes, has demonſtrated to my mind, that moſt peſtilential diſeaſes have originated, where they exiſted; and no one of them will ſpread or exiſt long, in an atmoſphere in which it will not originate.

The ſmall-pox does not uſually ſpread without infection; but I can prove, by many inſtances, that it does originate, in ſporadic caſes, without infection. In South-America, it ſpreads and becomes epidemic, in certain periods, then totally diſappears. Ulloa, book 6.

The venereal diſeaſe appears to be propagated ſolely by infection. It muſt however have originated at firſt without infection; and *may* ſtill, for aught we know, originate in the ſame manner.

But the attempt of phyſicians to palm this diſeaſe on the natives of America, is a moſt groſs and abominable attack on truth, perſevered in againſt the plaineſt and moſt indubitable evidence. In the annals of England, there is the cleareſt proof of the exiſtence of that diſeaſe, in the twelfth century; and it was the ſubject of legal proviſions as early as the year 1162, which laws are ſtill extant, and were then only a renewal of thoſe which *were ſtill more ancient.*

In the records of the Lordſhip of Wincheſter, there are many regulations reſpecting the ſtews which were authorized to be kept in Southwark; one of which expreſsly prohibits any "ſtew-holder to keep any woman, that hath the *perilous infirmity of* (Brenning) *burning.*†

In a book written from a manuſcript about 1430, in poſſeſſion of the biſhop of Wincheſter, one article begins thus; "de his qui cuſtodiunt mulieres habentes nephandam infirmitatem;" it goes on " item, That no ſtew-holder keep noo woman wythin his hous that hath any ſickneſs of *brenning*, but that ſhe be put out, upon the peyne of make it a fyne into the Lord of a hundred ſhylings."

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* "But where the extreme of vice was ne'er agreed;
Aſk where's the north? at York, 'tis on the Tweed;
In Scotland, at the Orcades; and there,
At Greenland, Zembla, or the Lord knows where."
Eſſay on Man, II. 221.

† *Burning* is a modern orthography; the ancient was *brent, brenning.* So Chaucer wrote it. Canterbury Tales, 2427, and in other paſſages.
"The fires *brent* upon the auter bright,
That it gan all the temple for to light."

That this was a common diſeaſe appears from the frequent mention of it in thoſe records; and that it was the ſame diſeaſe, now called *venereal*, appears from the deſcription of it given by Arden, phyſician to Richard II. and Henry IV. between 1377 and 1413; who ſpeaks of it as a " certain inward heat and excoriation of the urethra."

This diſeaſe was called a *burning* and went by that name, till the middle of the 16th century.

See Philoſophical Tranſactions, No. 357.
Baddam's Memoirs, vol. 6. 390.

It is aſſerted by European authors that this diſeaſe was prevalent among the natives of America, when the Spaniards firſt viſited the country. I cannot controvert the aſſertion, for I do not poſſeſs the original Spaniſh hiſtories of their firſt voyages. But it is poſſible this may have been true. It is ſomewhat ſtrange however, if that diſeaſe was formerly very prevalent among the natives, that in modern times, it ſhould hardly be known among them. Ulloa, in his voyage to South-America, book 6, declares that the " venereal diſtemper is ſeldom known among the natives," altho ſo common among the Spaniards as to have loſt the infamy attached to it in other countries.[*]

See alſo book 5. ch. 6.

The ſmall-pox has been ſuppoſed to have originated in Egypt or Arabia, and to have been propagated over the world by ſpecific contagion. But the ſmall-pox, altho we know not the time or place of its firſt appearance, is only a *new form* of that claſs of diſeaſes called, exanthemata, or eruptive. It is the produce of a *revolution in diſeaſe*, and now originates any where and every where, *without contagion.*

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[*] Theſe remarks on the origin of diſeaſes proceed ſolely from my love of truth and ſound philoſophy. I am no more anxious to exonerate the ſavages of America from the charge of communicating the lues venerea to Europeans; than I am to vindicate Egypt from the charge of originating all the plagues that have deſolated Europe. It is my wiſh to proſtrate that ſyſtem of error reſpecting the origin of peſtilential diſeaſes, which diſgraces modern days.

The following remark is of leſs conſequence. The Britiſh Dictionaries define the word *Buccaniers* by " Pirates of America or American Pirates." But names lead to error. The buccaniers were all originally Europeans, French and Engliſh, who committed piracies in the Weſt-Indies and Spaniſh America. Encyclopedia art. Buccanier. Thus the name " Heſſian fly" given in this country to a miſchievous inſect, is the offspring of ignorance and the parent of a material error in common opinion.

With reſpect to the origin of the lues venerea, we are left in the dark, as we are with reſpect to the ſmall-pox. It is agreed on all hands that none of the Greek and Roman writers on medicin, have deſcribed the diſeaſe. But there is not a ſhadow of doubt that a ſpecies of this diſeaſe exiſted in England as early as the Norman conqueſt; and probably in the other countries of Europe. Not a medical work of that period, if any was written in the weſt of Europe, has ſurvived the ravages of time; and we are indebted to the legal eſtabliſhment of ſtews in Southwark, for the evidence of the exiſtence of that diſeaſe.

It is however not at all improbable that about the year 1496, this diſeaſe might have acquired ſome new and malignant ſymptoms, and ſpread with a fatal rapidity, that might alarm mankind and render the diſtemper more an object of notice. Antecedent to that period, it might have been much more mild and leſs deſtructive. This idea is greatly ſtrengthened by the known fact that other diſeaſes had, about the ſame time undergone ſimilar changes. It was but about ten years before, that the plague took the *ſweating* form—an event as novel, as the generation of a new diſeaſe. What is more remarkable; in the very year aſſigned for the appearance of the lues venerea, an epidemic leproſy overran Germany; an event equally novel. Theſe facts confirm my ideas of certain revolutions in the ſymptoms of diſeaſes, correſponding with material changes in climate or modes of life.

CONCLUSION,

Addreſſed to the learned Societies, in America, Europe and Aſia.

THE preceding hiſtory of Epidemic diſeaſes was undertaken ſolely from a deſire of inveſtigating the truth, reſpecting the origin and phenomena of theſe terrible ſcourges of the human race. When the peſtilence appeared in the United States in 1791 and 93, I had not a ſuſpicion that the popular doctrins reſpecting contagion, are not well founded. The frequent recurrence of the diſeaſe in ſubſequent years, in oppoſition to all the beſt efforts of health officers, in executing rigid laws of quarantine, had, in 1795, ſhaken my confidence in thoſe doctrins. My inveſtigations in that and the next year, convinced me that the peſtilential fever which has viſited ſo many parts of America, is generated in the country; but ſtill I had not the leaſt ſuſpicion of a connection between epidemic diſeaſes. The inveſtigations of the year paſt, have reſulted in unfolding principles and facts to me altogether *new* and *ſurpriſing*; they cannot therefore be aſcribed to a wiſh to eſtabliſh a preconceived theory.

Theſe reſults not only confirm my ſuſpicions that the peſtilence of America is of domeſtic origin, but they overthrow the preconceived ſyſtem of the origin of peſtilence, in temperate latitudes, from fomes conveyed to thoſe climates from ſouthern regions; and demonſtrate that it originates occaſionally in all latitudes from the 25th to the 65th.

It is demonſtrated that peſtilence, in temperate latitudes, is never an iſolated epidemic, but the criſis of a ſeries of epidemics; and we are furniſhed with the means of determining unequivocally the character of peſtilence in every caſe, on the following ſimple principles.

" If, on the appearance of peſtilence in a particular place, all other diſeaſes ceaſe, or take ſome of its predominant ſymptoms, that peſtilence is generated in that place, and dependent on the ſtate of the elements."

It is impoſſible, on phyſical laws, that this criterion ſhould ever fail.

Another criterion, almoſt infallible, is the prevalence of certain diſeaſes before and after the peſtilence. If peſtilence is immediately preceded by meaſles, affections of the throat, inflammatory or typhus fevers with anomalous ſymptoms, and eſpecially by catarrh, that peſtilence is an epidemic, produced on the ſpot, and only the *autumnal form of diſeaſe*—the other diſeaſes, preceding and following, being the vernal and hybernal forms, produced by the ſame general principle.

Of the peſtilences which afflict mankind, in all climates, an immenſe proportion, probably nineteen twentieths, belong to this ſpecies—they are epidemics, beginning and ending at the command of the elements, under the co-operating influence of ſeaſons and local cauſes.

Theſe epidemic peſtilences are more or leſs infectious, according to their violence, or the places where they exiſt. In cloſe rooms and narrow alleys they are dangerous; hence their mortality in fleets, camps, jails, and particular parts of cities. But the infection of ſuch diſeaſes extends to the diſtance of a few feet only, and is capable of diſſipation in a free air, ſo as to reduce the danger of attending the ſick almoſt to nothing. The ſame is true of diſeaſes of mere infection, not epidemic.

Diſeaſes, dependent on infection only, are ſometimes introduced into cities and hoſpitals, and occaſion conſiderable mortality. But they are propagated by contact or near approach only, and do not affect the character of other diſeaſes current in the place.

The conſequence reſulting from theſe principles is, that *epidemic* peſtilence is not under human control—but diſeaſes propagated by mere infection may be arreſted and ſubdued.

The only means of avoiding or mitigating epidemic peſtilence are firſt to withdraw the aid of local cauſes; ſecondly to fit the body, by modes of living, to reſiſt its cauſes—and thirdly, on failure of theſe, to remove from the place where its exiſts.

The infection of all diſeaſes, even thoſe of ſpecific contagion, as ſmall-pox and meaſles, may be avoided by keeping at a diſtance from the diſeaſed. The infection of diſeaſes not ſpecifically contagious, as plague, yellow-fever, dyſentery and jail fever, may be nearly deſtroyed by free air, and cleanlineſs.

With reſpect to the primary cauſes of epidemic diſeaſes, we are in the dark ; but we are certain, from all hiſtory and modern obſervations, that the cauſes of epidemic diſeaſes among the human race, affect every ſpecies of animal and vegetable life.

The opinions which I have ſuggeſted concerning the general cauſe, ſeem to have a foundation in the coincidence of epidemic diſeaſes with numerous electrical phenomena. At the ſame time, the reader will conſider theſe opinions rather as *conjectural*, than *poſitive*. No certain concluſions can be drawn from an interrupted and imperfect ſeries of facts. More materials are neceſſary to enable us to erect a theory of epidemics which ſhall deſerve full confidence.

The common doctrin of contagion is utterly inſufficient and unphiloſophical ; for if admitted, it never leads us nearer to the cauſe. If we trace the yellow fever to the Weſt-Indies, and the plague to Egypt or Conſtantinople, we are not an inch nearer to the ſource ; for theſe diſeaſes are not always to be found in thoſe countries ; and the people there are as much puzzled to find the ſource of them, as the people of Great Britain or America.

If we trace theſe diſeaſes to the coaſt of Africa, or to Siam, we are as diſtant as ever from the ſource ; for many times, the diſeaſes are not to be found in thoſe countries, and ſeldom indeed are they ever found within the tropics, except among foreigners.

Indeed nothing is more common than for the yellow fever to be *imported into the Weſt-Indies in veſſels from the United States*. When veſſels from northern latitudes have long paſſages, it often happens that ſeamen are ſeized with the diſeaſe, before they arrive at the iſlands ; and the Weſt-Indians may often allege the diſeaſe to be *imported in ſuch veſſels, when it does not exiſt in the United States*.

In ſhort, the doctrin of deriving all peſtilential diſeaſes from contagion or infection, were it not for the immenſe miſchief it does to ſociety, would not deſerve a ſerious refutation. Infection is a *ſubordinate cauſe* of the propagating of malignant diſtempers ; but is itſelf an *effect* of ſome more general cauſe, whoſe force is a hundred fold more powerful and formidable than that of infection. I have, in condeſcenſion to popular opinion, ſtated the evidence of the domeſtic origin of the bilious plague, as it ſtands on the arrival or non-arrival of veſſels, and other facts of that kind. But I really conſider all this evidence as trifling, when compared with the phenomena of the diſeaſe itſelf and its precurſors and attendants. The uniform appearance of other epidemics, as introductory to peſtilence, and manifeſting an eſſential change in the atmoſphere, with the numerous accompaniments of the plague and yellow fever, amounts to evidence of domeſtic origin, which leaves no room for cavil or controverſy.

For the purpoſe of collecting facts, the only ſafe foundation of principles, and comparing the phenomena of diſeaſes and the elements, which occur nearly at the ſame time, in different countries, I ſincerely wiſh and requeſt that all medical and philoſophical ſocieties would undertake to regiſter facts and reciprocally to communicate them, by means of a general correſpondence. The facts to be regiſtered might be comprized under the following heads.

The time of the appearance and diſappearance of any epidemic diſeaſe, with its general hiſtory.

The places where it firſt occurs to be deſcribed, in regard to land and water, height of the land, conſtruction of the city or ſtreets, poſition as to points of compaſs, woods, moraſſes, &c. The claſſes of people moſt generally affected.

The general ſtate of the ſeaſons, as to heat, and cold, drouth and moiſture.

The time of earthquakes, meteors, lumen boreale, and all ſingular celeſtial appearances—with unuſual tempeſts, eſpecially when accompanied with hail—all compared with the lunar phenomena.

The appearance of unuſual inſects of all kinds, and any circumſtance attending them.

Diſeaſes among cattle, ſheep and other animals.

Sickneſs and death of ſiſh of all kinds.

Volcanic eruptions, with the phenomena preceding, attending and following them.

For the purpoſe of aſcertaining the lunar influence on the human body, or any diurnal influence, it would be deſirable that medical gentlemen ſhould note the days and the hours of the day when perſons are ſeized with particular diſeaſes—eſpecially epidemics—the hours of exacerbation and of paroxiſms in fever—the hours which are moſt fatal to the diſeaſed—and the time when convaleſcents are moſt apt to relapſe.—Theſe facts ſhould be compared with the poſition of the moon, in her orbit, and eſpecially in regard to her perigee and apogee; conjunction and oppoſition; as alſo with the tides in the main ocean.*

Should the principles unfolded in the preceding work prove to be well founded, they will lead to many important practical inferences.

I. If peſtilential fevers never appear in the temperate latitudes, without certain precurſors, men will, with careful obſervations, be enabled to foreſee the danger and prepare for it; or to uſe uncommon diligence in removing the ſubordinate local cauſes.

II. If in certain years peſtilential fevers are more predominant, than in others; and the condition of the elements fitted to produce them, is univerſal over ſea and land, the fact is of no ſmall moment in maritime affairs. Double precautions will be taken in fleets, and in merchantmen bound on long voyages.

III. If peſtilence is progreſſive and firſt manifeſted in certain malignant fevers, the fact may be of great utility to large cities. The approach may be perceived in time to ſave the inhabitants by flight, if not by other precautions.

IV. If no plague or yellow fever ever appeared in temperate climates, unleſs announced by other diſtempers, the magiſtracy may be enabled to diſtinguiſh when there is danger, and when not; and may avoid innumerable vexations to commerce, ariſing from the rigid execution of health laws, when there is not the leaſt occaſion.

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* The time of high and low water in rivers and bays may not be the true time, in the open ſea—or of the greateſt and leaſt influence of the moon.

V. But a moſt important uſe to be made of the facts here collected, will be, to guard public health from the ill effects of bad proviſions. If, in peſtilential periods, ſalt is leſs efficacious in preſerving fleſh, and by means of a greater fermentation of the juices, fiſh and fleſh are more readily diſſolved by a putrefactive proceſs, more caution will be found neceſſary in packing and repacking them, and more care to avoid uſing it in a bad ſtate.

If the effluvia of diſſolving fleſh and vegetables are more poiſonous and prejudicial to health at ſome times, than at others, it is of importance that, on every ſuch occaſion, early notice ſhould be given of the danger.

If animals, which conſtitute a part of the food of men, are ſubject to epidemic diſtempers, they cannot be eaten with ſafety, while affected by diſeaſe. When fiſh or fowls are ſickly and many of them die, or become lean, the fact ſhould be aſcertained by the faculty or a board of health, and public notice ſhould be given, that people might avoid uſing them as food. In ſome inſtances, fiſh are ſo ſickly as to excite nauſea; in which caſe the uſe of them ſhould be forbidden.

I will cloſe this treatiſe with the following reflections.

In the conſtruction of the univerſe, we obſerve every part of the ſyſtem to be governed by uniform laws, adapted, with infinite ſkill, to preſerve harmony and order. Limited as our underſtandings are, we can diſcover many of theſe laws, which are calculated to impreſs on our minds the moſt ſublime ideas of the univerſal intelligence and wiſdom of their Great Author.

The exiſtence of natural and moral evils has led ſceptics to queſtion the perfections of the author of nature. But doubts on this ſubject argue want of knowlege or want of candor. It is extremely evident that all the neceſſary evils of the ſyſtem are calculated to produce good. The operation of that univerſal principle of light, heat and fire, which pervades our ſyſtem, and which is inceſſantly compounding and decompounding the other more ſluggiſh materials of the earth and atmoſphere, are eſſential to the viciſſitudes of the ſeaſons, rain, ſnow, hail and dew, which are neceſſary to preſerve the principles of animal and vegetable life. Storms, hurricanes, earthquakes and volcanic eruptions, however inconvenient to men at particular times and places, are among the means of giving to the principles of life, more equal diſtribution, and of renewing their energies.

Epidemic diſeaſes are ſome of the neceſſary effects of the general laws that govern the univerſe. But they have alſo a final cauſe of immenſe value to the human race. They are deſtined and calculated to anſwer moſt important moral and religious purpoſes.

Men, with their preſent nature, under a conſtant courſe of proſperity, would degenerate into devils or brutes. Uninterrupted eaſe and quiet contract the heart and ſteel it againſt emotions of ſenſibility—the man ruſhes into vices and crimes, or ſinks into ſloth. So often have I ſeen the hearts of men depraved and their moral character debaſed, by ſudden proſperity, that I am perſuaded the world, without frequent inflictions of pain and diſtreſs, would not be habitable. The natural evils that ſurround us, intermingled with innumerable bleſſings, preſerve the mind in perpetual vigor, in ſeeking the means of protection; they lay the foundation for the exerciſe of the fineſt feelings of the human heart, *compaſſion and benevolence,* which are the ſources of ſocial virtue; they humble the pride and arrogance of man, by creating in his mind a perpetual dependance on divine power; in ſhort, they create and preſerve that ſenſe of obligation and accountability to God which is the germ of piety, and moral excellence.

ADDENDA.

Of the Lunar Influence.

IT is a well known fact that the moon has a great influence on the elements of this globe, the effects of which are very viſible in the viciſſitudes of weather. This influence is ſuppoſed to be the principal regulator of the tides, and the efficient cauſe of the changes in the atmoſphere, which produce rain, hail, ſnow and wind. It is believed alſo to affect the growth of plants, and Pliny, ſollowed by St. Pierre, alleges that the lunar rays diſſolve ſnow and ice. Popular opinion conſiders the moon as exerting a powerful influence on animal ſubſtances, and it is an incontrovertible fact that its beams accelerate the putrefaction of fleſh and fiſh. Fiſhermen and ſailors can all atteſt this fact, and it coincides with what Pliny aſſerts. Nat. Hiſt. lib. 2. 101. "Id manifeſtum eſſe, quod ferarum occiſa corpora in tabem viſo ſuo reſolvat."* Moon light diſſolves or corrupts the fleſh of animals that are killed ; it renders ſound fiſh ſoft in a few hours, and fiſhermen are careful to cover from its rays the fiſh they have caught. It probably acts upon fleſh by ſtimilus, exciting a fermentation in the juices.

The Newtonian theory of tides, which explains the phenomena by lunar attraction, has been recently called in queſtion and warmly oppoſed by the ingenious St. Pierre, in his ſtudies of nature, who ſubſtitutes a ſcheme of his own, which aſcribes the tides to the diurnal effuſions of the polar ices. I am charmed with the writings of St. Pierre, which have opened a new and entertaining volume of the works of nature. But his theory of tides ſeems to manifeſt none of that ingenuity, which is conſpicuous in other parts of his writings, and is utterly unſatisfactory.

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* St. Pierre affirms that the moon melts ice, and relies on the paſſage of Pliny in the chapter cited, "glaciem refundat"—but it is queſtionable whether the paſſage will bear that conſtruction ; and if it will, the aſſertion of Pliny is not ſupported by modern obſervations. See Studies of Nature, Vol. 1. Expl. of the plates, p. 69. Ice is diminiſhed by evaporation in moon light, without forming water.

In the firſt place, during ſix months or more, in each polar region, no ſnow or ice is melted, unleſs by the moon. The ſun is below the horizon, and the moon's influence, if it diſſolves ſnow and ice according to Pliny, evaporates all the water produced. This is a fact that accords with modern experiments, that ice in the night, however cold, loſes a part of its weight, but it is by inſenſible evaporation.

To remove this difficulty, St. Pierre ſuppoſes the tides in one polar region to be the effect of the melting of ſnow and ice, in the oppoſite polar regions. But to this hypotheſis we may oppoſe an inſuperable objection, derived from the great and univerſal laws of equilibrium, obſerved by water. A diurnal wave or elevation would inevitably ſubſide into a level, before it could reach the equator, or even the temperate latitudes. Beſides the Atlantic is of very various breadth, in different latitudes. Between the coaſt of Brazil and Terra Firma on one ſide and Africa on the other, the breadth is ſcarcely half as great, as in the latitude of 25 deg. north. A diurnal wave compreſſed and dilated, in theſe different ſituations, muſt exhibit the tides in one place, twice as high as in another; but in the regions mentioned, this is not the fact.

There are many of the phenomena of the tides which cannot be explained on St. Pierre's hypotheſis; but the foregoing remarks are ſufficient for my preſent purpoſe. The tides doubtleſs depend on lunar and ſolar influence; but the phenomena cannot be ſolved on the common theory of *attraction*. In this reſpect, I am confident the Newtonian theory, as explained by Kepler and others is as inadequate, as that of St. Pierre. The latter author has enumerated ſome inſuperable objections to that theory, to which the reader is referred. But I have other obſervations to make on this ſubject, which are probably new.

The manner in which aſtronomers have attempted to explain the oppoſite tides, is as follows. "The power of gravity diminiſhes as the ſquare of the diſtance increaſes—therefore the waters on the ſide of the earth next to the moon, are more attracted than the central parts of the earth ; and the central parts are more attracted by the moon than the waters on the oppoſite ſide of the earth—therefore the diſtance between the earth's center and the waters on its ſurface, under and oppoſite to the moon, will be increaſed. The earth by its gravity falls towards the moon —the water directly below the moon riſes and ſwells towards her —the water on the oppoſite ſide recedes from the center and riſes—or ſtrictly ſpeaking, the center recedes from the water. On the ſides of the earth between the points under and oppoſite to the moon, the water is depreſſed and falls below the former level."

See Ferguſons's Aſtronomy, on the Tides, and Encyclopedia, Art. Aſtronomy, 363.

As I am not about engaging in aſtronomical or mathematical calculations, I ſhall content myſelf with ſtating theſe general principles of Newton, Kepler, and later aſtronomers, with a few objections.

I. This theory does not explain, in a ſatisfactory manner, the reaſon why there are no tides in lakes and Mediterranean ſeas.

If the principle is juſt, that the earth recedes from the water oppoſite to the moon, leaving the ſurface of it at a greater diſtance from the center, why, when the Euxine or Mediterranean is oppoſite to the moon, does not the earth beneath theſe ſeas, recede from *their* waters, as well as from the waters of the ocean, in the ſame longitude ? The earth conſiſts of ſolid ſubſtances, and by the laws of attraction, muſt, in all its parts, be moved equally, under the ſame circumſtances of diſtance from the attracting body and denſity, or ſolid contents. To ſuppoſe the earth, when covered by an ocean, to be attracted by the moon, and not when covered by a lake or arm of the ocean, is, in my view, neither logic nor philoſophy.

Nor is the reaſon aſſigned for the defect of tides in lakes and ſeas, on the ſide next to the moon, in the leaſt ſatisfactory. It is found in the Encyclopedia in theſe words. " There are no tides in lakes becauſe they are generally ſo ſmall, that when the moon is vertical ſhe attracts every part of them alike, and therefore by rendering all the water equally light, no part of it can be raiſed higher than another."

But this explanation does not meet the difficulty. The Newtonian theory ſtands on the hypotheſis that the waters on the ſide of the earth next to the moon, are more ſtrongly attracted than the adjacent land; therefore they riſe above ſeveral feet of the earth. But the ſolution above recited does not reach this point; for the waters of the ocean riſe *higher* than the contiguous earth; but the waters of lakes always obſerve the ſame relative altitude on their ſhores. If then the moon attracts the waters of lakes at all, or occaſions them to riſe, it attracts the adjoining earth and raiſes it in the ſame degree as the waters; but in regard to the ocean, it attracts the water and leaves the contiguous earth behind. In ſhort, if attraction and gravity have uniform laws, as we muſt believe they have, the attraction of the moon will *not* account for tides in the ocean, while there are none in lakes and inland ſeas.

II. If the moon's attraction is the cauſe of tides, why is its force much leſs in the equatorial regions, than in the diſtant parts of the globe? It is a well known fact, that the tides within the tropics are very ſmall, and that they are more conſiderable as we recede from the equator towards the poles. This is contrary to what ought to be the caſe, on the principles of attraction; for on the Newtonian theory of gravity, the higheſt tides ſhould be on the parts of the earth neareſt to the moon. The reverſe of this is the caſe, and the circumpolar regions of the earth have the higheſt tides. The tides within the tropics are from 12 to 24 inches—in the latitude of Greenland, almoſt as many feet.

III. The theory of Newton is not reconcileable with his own principles of gravity, which ſuppoſe the force of it to be equal to the quantity of matter contained in bodies. Now the theory implies that on the ſide of the earth next to the moon, the water is attracted *more* than the earth; but on the oppoſite ſide, *leſs*. This cannot be ſolved on the principle of *diſtance;* for this is too ſmall to account for a hundredth part of the effect. Indeed the water and the land on the ſhore, may be conſidered as at the ſame diſtance.

Nor can it be ſolved on the principle of a difference in the quantity of matter, in earth and water. If the earth, having more denſity and matter, is moſt attracted, the principle muſt act uniformly on both ſides of the earth—on both ſides, the earth muſt move towards the moon further than the water, which is contrary to fact.

If the water has moſt matter, the ſame principle muſt govern it on both ſides of the earth, and move it fartheſt towards the moon.

But here the principles of coheſion interfere with all theſe deductions. Theſe principles are ſo powerful, as to overcome the attraction of a diſtant body, nor is it to be ſuppoſed that the power of the moon overcomes the force of coheſion, and by attracting the parts of the earth next to it more than the parts on the oppoſite ſide, changes the form of the earth from a ſphere to a ſpheroid. It is not ſuppoſed that the whole ſolid maſs of the earth is continually changing its figure by means of lunar attraction. If ſo, this figure muſt be rotatory.

The theory then ſuppoſes that on the ſide next to the moon, the water is moſt ſtrongly attracted and riſes above the earth—but on the ſide oppoſite, it is attracted leſs than the earth. The ſolid globe is moved towards the moon, and the water left lagging behind ! What is more ſingular, the earth near the equator, on the ſide oppoſite, is drawn only two feet further towards the moon than the water, or perhaps but one foot ; while in the temperate latitudes, it is drawn ſix or eight feet, and in the latitudes of 60 and 70 degrees, fifteen, eighteen, and twenty-five feet further than the water. This may be philoſophy, but to me it is utterly unintelligible !

Nothing is a more ſerious misfortune to ſcience, than the errors of a great man. Moſt of mankind take principles and facts upon truſt, and defend them with a zeal proportioned to their confidence in the man who has publiſhed them. I revere the character of Newton, of Kepler and of Haller ; but this veneration does not in the leaſt incline me to receive their doctrins without being convinced that they are well founded. After moſt careful inveſtigation, I am ſatisfied, that the principles of attraction, will not account for the tides oppoſite to the moon, nor for the difference between the height of the tides in different latitudes. Yet I have not the leaſt doubt, that moſt of the phenomena of tides are regulated by the moon.

If I was aſked, on what principles the tides depend, my anſwer would be, *I do not know*. But numerous facts, all concurring to the ſame point, lead me to *ſuſpect* the vibrations of the ocean to depend on electricity, influenced by the moon, the ſun, or other diſtant orbs, and acting by repulſion as well as attraction; or by increaſing and diminiſhing the elaſticity of the water.

In the firſt place, it is agreed among philoſophers, that the air, when free from vapor, is an electric; that when cold, it is moſt electric, and when heated, it becomes a conductor; and conſequently that the atmoſphere in the torrid zone is always in a conducting ſtate, while the air of the northern regions, if clear, is an electric. In ſhort, it is agreed that the atmoſphere of the temperate and frigid zones contains more electricity, than that of the torrid zone.

Theſe facts correſpond with the phenomena of tides. In the regions, where there is the leaſt electricity, there is the leaſt intumeſcence of the ocean—thoſe are the equatorial regions. There, the temperature of the air alſo ſuſtains very ſmall variations; ſo does the height of the ocean. As we recede from the equator cold and electricity increaſe; ſo does the elevation of the tides.

Again, the ſame train of phenomena attend the barometer. Within the tropics, the variations of the mercury in this inſtrument, are very ſmall; but in the temperate and cold regions, they are more conſiderable, and increaſe as we recede from a warm to a cold and electric atmoſphere.

Similar phenomena attend the twilight. Within the tropics, the twilight is of much leſs duration, than in cold regions. "Heat, ſay philoſophers, diminiſhes the air's refractive power and denſity, and cold increaſes both. The horizontal refractions are near one third leſs at the equator, than at Paris."

Ferguſon's Aſtron. 97.

The denſity of the atmoſphere, within the tropics, may be leſs than at the polar circle; but the weight is nearly the ſame, the barometer being in general as high at the equator, as in northern latitudes. But the air, in hot climates, has leſs powers of refraction; that is, there is more power of refraction in an atmoſphere that is moſt perfectly electric, or that contains moſt electricity.

It is remarkable alſo that, in equatorial climates, the atmoſphere exhibits no viſible ſtreams of electricity; as it does in the polar circles.

I know not how far this parallel may be extended; but there is a ſurpriſing reſemblance between all theſe phenomena. In general then we obſerve that in the equatorial regions, the denſity, weight, elaſticity and temperature of the atmoſphere, are more nearly uniform, than in northern climates; and the elevation of the ocean in tides correſponds with this uniformity. As we recede from the equator, the variations of the atmoſphere increaſe, and ſo do the variations in the height and depreſſion of the water.

From theſe phenomena a ſuſpicion ariſes, that the medium by which the moon and ſun act upon the ocean, is the electrical fluid; as their influence appears to be in proportion to the electricity of the atmoſphere. Hence the higheſt tides at a diſtance from the equator, where the heat and cold and elaſticity of the air are ſubject to great variations.

By what law, it will be aſked, is this effect produced? I readily confeſs my ignorance. But the phenomena of oppoſite tides ſeem to bear a great affinity to the well known laws of electricity, *attraction* and *repulſion*, and a *poſitive* and *negative* ſtate. I pretend not to account for the phenomena, for I am perſuaded that the experiments on electricity which man is capable of making, will never unfold *all* its properties, nor explain *all* the laws by which this energy of nature is exerted in the government of the material ſyſtem.

But the influence of the planets on the elements of this globe has, in all ages, been a ſubject of belief or of deriſion; and ſurely it is a ſubject in phyſics much more intereſting to man, than many ſpeculative queſtions which cannot affect his health and happineſs, but which occupy the labors of inveſtigating minds. I will therefore throw together a few obſervations which may afford light on the ſubject; or at leaſt may excite a ſpirit of enquiry.

In the firſt place, it is generally known and admitted that the influence of the ſun and moon upon this globe are in proportion to their proximity. The higheſt tides are when the moon is in her perigee, and in conjunction with the ſun, and eſpecially when the earth is in her perihelion, or neareſt to the ſun. But the moon exerts more than uſual influence on the atmoſphere, in other poſitions. Her power is greateſt in her perigee and apogee, and in her conjunction and oppoſition to the ſun. Her influence on the tides, under the combined and ſeparate operations of theſe circumſtances, has been fully illuſtrated. But her influence on vegetation, on the viciſſitudes of weather, on health, and the phenomena of the electrical fluid in earthquakes and volcanic eruptions, ſeems to have paſſed unobſerved, or at leaſt, to have never been reduced to any thing like ſyſtem.

One of the moſt ſtriking effects of lunar influence, is obſervable in earthquakes, which uſually happen near the time of the moon's perigee or apogee, conjunction or oppoſition. As this fact ſeems to have eſcaped obſervation, I will here inſert proof of it.

The great earthquake which demoliſhed Lima on the 28th day of October 1746, happened ſix hours before the full moon, and the day before her apogee.

That which deſtroyed Liſbon Nov. 1, 1755, was three days before the change and four before her perigee.

The great ſhock in America on the 18th of the ſame month was a few hours after the full moon, on the day of her apogee.

The great earthquake in America on the 2d of June O. S. 1638 was on the day after the new moon and near her perigee. [Some accounts place this on the firſt of the month, in which caſe it was the ſame day with the change.]

The ſhock which convulſed America, and demoliſhed mountains in Canada January 26th O. S. 1663, was on the day preceding the new moon.

The great earthquake in South-America, June 3d O. S. 1744 was four days after the new moon.

The memorable earthquake in North-America on the 29th of October O. S. 1727, was about three days before the new moon, but on the day of her perigee.

The ſhock in America on the 29th of November 1783, was on the day after the moon's perigee.

That on the 16th of May 1791, was on the day of her perigee and one day before the full moon.

The ſhock on the 1ſt of November 1761, was the day before her apogee.

The great earthquake in Iceland on the 10th of July 1789, was on the day of her apogee, and three days after the full.

That in Tuſcany on the 30th of September in the ſame year, was two days before her apogee, approaching the full.

A ſhock at Liſbon on the 27th of November 1791, was two days after her perigee and change.

A ſhock on the 15th of January 1791 in Virginia, was two days after her apogee, and approaching the full.*

Theſe two laſt inſtances, according to another almanac, happened *one* day after the perigee and apogee. I have not taken pains to enter into *exact* calculations of the moon's place, as I do not deem it material. It is ſufficient for my purpoſe that *almoſt all* earthquakes happen near the time of the moon's conjunction and oppoſition, or her perigee and apogee. Of theſe poſitions, it is obvious that her perigee and apogee have much the moſt influence; and the inſtances I have examined are almoſt equally divided between theſe two poſitions. Of all the earthquakes which I have compared with the moon's place, one or two only fall in her quadratures, and at her mean diſtance from the earth. An inſtance happened on the 11th of April 1799 in Carolina. I have compared ſeveral other inſtances, which happened near the perigee and apogee, but it is unneceſſary to ſpecify them. The examples mentioned will eſtabliſh the generality of the fact, and the ſoundneſs of the principle.

On the principles of *attraction*, it will readily be admitted that the proximity of the moon to the earth, at certain periods of her revolution, muſt *draw*, or excite into action and diſcharge, the electricity, of the earth. This accounts for earthquakes during the moon's perigee. But on enquiry we find a great proportion of the ſhocks take place during her apogee, when her diſtance is greateſt and her ſuppoſed power the leaſt ; and not only ſo, but during her oppoſition to the ſun, when her *diminiſhed* influence is ſuppoſed to be counteracted and ſtill *further diminiſhed* by the attraction of the ſun. This is an important fact and deſerves inveſtigation. That the influence of the moon is the direct exciting cauſe of earthquakes, can hardly be queſtioned, after eſtabliſhing the fact, that four out of five, or a much larger proportion, happen when ſhe is in particular parts of her orbit ; but why her greateſt diſtance and her leaſt, ſhould produce exactly the ſame effects, a fact equally well eſtabliſhed, is a queſtion which can perhaps be ſolved only on electrical principles.

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* A ſevere earthquake in the weſt and north of France on the 25th of January of the preſent year, 1799, was a few hours after the moon's perigee.

That the electricity of the atmoſphere and earth, is the medium by which the moon acts upon the elements of the globe, is rendered probable by another fact. I poſſeſs the exact dates of very few volcanic eruptions ; but by comparing ſuch as I have, with the moon's place in her orbit, I find theſe eruptions begin or ſuffer violent exacerbations, at the time the moon is in her perigee or apogee ; or in her conjunction or oppoſition.

The great eruption of Veſuvius in 1779 was augmented on the 8th and 9th of Auguſt, when the moon was in her perigee.

The tremendous eruption of Heckla in 1783, began on the firſt of June, when the moon was in her apogee, and increaſed till the 8th, after which it continued to be violent for a long time.

An eruption of Veſuvius on the 10th of May 1784 was during the moon's perigee

An eruption of fire near Palermo in Sicily on the 13th of March 1785 was two days after her perigee.

An eruption of Etna on the 19th of May 1780, the dark day in America, was the day after the full moon.

A dark day on the 9th of Auguſt 1732 was about the time of the new moon, and her apogee. The dark day at Detroit October 16, 1762 was the day after her perigee, and one day before the change.

The eruption of Veſuvius March 8th, 1730 was on the day after the new moon, and a great exacerbation happened on the 14th, the day before her apogee.

The great eruption of the ſame volcano in 1794 was announced on the night of the 12th of June, nine hours before the full moon, by a violent earthquake. The eruption took place on the 15th.

The darkneſs in Canada, on the 15th and 16th of October 1785 was on the days next preceding the full moon and her perigee. The obſcurity on the 9th of that month was near the quadrature.

The eruption of Heckla in 1766 began on the 15th of April, the day before the moon's apogee.

The great eruption of Veſuvius and the earthquake, which buried Herculaneum, on the 1ſt of November A. D. 79, were the ſecond day after her perigee.

The influence of the moon in producing ſtorms of rain, ſnow and wind, is univerſally admitted ; and that theſe happen near the poſitions of the moon already deſcribed, no man will undertake to deny. The Weſt-Indians expect hurricanes only near the time of the full and new moon ; or her perigee and apogee. This is further evidence that the electrical fluid is the inſtrument of theſe commotions in the atmoſphere. Electricity is known to be the cauſe of winds, and its agency is viſible in producing hurricanes ; for experienced ſeamen foretel a hurricane by the unuſual tranſparency of the water. Now it is a well known fact that electricity poſſeſſes the ſingular property of giving tranſparency to opaque bodies.

A little before a hurricane in the Weſt-Indies, ſeamen can ſee the lead, at an unuſual depth ; the ſea alſo ſwells and rolls upon the ſhore in a ſingular manner, tho the air is perfectly tranquil. An effervеſcence alſo or bubbling is obſerved in the water. Dark clouds are formed, and the atmoſphere, before the tempeſt, is obſerved by vapors ſenſibly mephitic. See a letter from Gov. Ellis, dated March 6, 1789, in the 9th vol. of Muſeum, 215. Hence we obſerve the correctneſs of the common ſaying among ſeamen, that " hurricanes come out of the ſea." They are evidently generated by extraordinary diſcharges of electricity. Hence they are moſt frequent in the windward iſlands, which are all volcanic; ſome of them ſtill diſcharging fire and ſmoke at times, and all of them evidently reſting on a volcanic baſe.

Further, that electricity is the great agent in theſe agitations of the elements is rendered probable by the coincidences in time, between the more violent hurricanes, and great volcanic diſcharges from Etna, Veſuvius and Iceland. Witneſs the terrible hurricanes of 1747, 1766, 1772, 1780, 1784 and 5, all of which happened near the time of great eruptions from the volcanoes mentioned; all of which are diſtinguiſhed in the annals of the Antilles, and ſtill recollected with horror by the inhabitants. And this circumſtance is no inconſiderable evidence, that the agent in volcanic eruptions, as well as in hurricanes, is electricity, and that this element is often diſturbed or ejected from the whole globe, nearly at the ſame time.

Moſt of the great tempeſts, in all latitudes, happen near the moon's perigee and apogee; and in theſe poſitions, we obſerve eſſential changes in the temperature of the atmoſphere. I have taken ſome pains to compare the changes in heat and cold, with theſe poſitions of the moon, with a view to learn, whether the effects are uniform. On examining the ſtate of the thermometer for two years, I find that, in almoſt every inſtance of the moon's perigee and apogee, eſpecially in winter, there was a conſiderable change of temperature. Uſually the weather grew colder, as the moon approached her perigee. But the effects were not uniform; ſometimes the weather became more temperate, at the perigee. But one general remark will be found true; that in regard to heat and cold, the moon's apogee and perigee produce, at different times, preciſely the ſame effects. This remark accords with what has before been obſerved in regard to earthquakes.

It is a general remark that the weather becomes cooler as the moon approaches the change. Should this remark prove to be well founded, the reſult would be this principle, that the cold is increaſed, or rather the heat leſſened, by the combined influence of the ſun and moon. This principle would accord with another obſervation juſt made, that the weather is cooler, during the moon's perigee, which is generally true in winter. That is, the greater power is exerted by diſtant orbs on our atmoſphere, the more the heat is diminiſhed. But this obſervation is not univerſally true. It is true that our winter occurs during the earth's perihelion ; but this is uſually explained on the principle of the obliquity of the ſun's rays—a ſolution that perhaps is not completely ſatisfactory, altho, to a certain degree, it is doubtleſs juſt.

It is a popular opinion that vegetation is leſs rapid, and the fleſh of animals leſs firm and ſubſtantial, and new-ſhooting plants leſs vigorous, during the wane of the moon, than during her increment. This opinion is too general and too reſpectable, to be conſidered the fruit of ignorance and credulity.

Ariſtotle alleges that the cloſe of the lunar month is cooler than the other parts of it ; and that during the decreaſe of the moon, the bodies of living animals poſſeſs leſs heat than at other times. De gener. animal. lib. 2. 4. Theſe remarks, whether true or not, coincide with the modern popular opinion juſt recited.

We are apt to neglect the opinions and practices of barbarous nations, and to hold in contempt the knowlege of ancient nations. This often happens, I ſuſpect, becauſe we are leſs wiſe, than thoſe whom we affect to deſpiſe. Ceſar in his firſt book of the Gallic war, chapter 40, relates, that the ancient Germans, who were great obſervers of the phaſes of the moon, declined engaging in battle, during the wane of that planet. He had offered battle to Arioviſtus, but this commander declined a general action, and permitted only ſkirmiſhes. Ceſar enquired of his priſoners the reaſon of this conduct, and was told that it was cuſtomary with the Germans to conſult their venerable matrons, who, by means of lots and divination, pronounced on the propriety of giving battle ; and theſe had declared that it was not poſſible for the Germans to conquer, if they engaged in action before the new moon. " Non eſſe fas Germanos ſuperare, ſi ante novam lunam prælio contendiſſent." See Ceſar's Commentaries, in the paſſage cited, and Henry's Hiſtory of Britain, vol. 1. ch. 4.

We have this cuſtom of the Germans preſented to us, diſguiſed with ſuperſtition ; but I ſtrongly ſuſpect it had its origin in the obſervation of the fact, mentioned by Ariſtotle, that in the decreaſe of the moon, animal bodies have leſs heat and vigor.

I am the more inclined to believe this, becauſe the doctrin accords with modern obſervations concerning the invaſion of fevers, and eſpecially of epidemic diſeaſes. Many medical authors concur in the fact, that diſeaſes more generally attack the human body on the ſecond or third day before the new or full moon. On examining the accounts of ſeveral writers, I find the times of invaſion to be two or three days before or after the new and full moon, or about the time of its conjunction with the ſun. See Jackſon, Grainger, Lind and many other authors.

Diemerbroeck is explicit on this point. He relates that in the plague of 1636, "two or three days before and after the new and full moon, the diſeaſe was more violent ; more perſons were ſeized at thoſe times, than at others ; and thoſe who were then ſeized, almoſt all died, in a very ſhort time. Many patients who appeared before to be ſlightly affected, *neſcio qua virium labefactione oppreſſi*, ſays the author, by an unaccountable decline of ſtrength, ſunk and died in a few hours."

De peſte, page 9.

From the obſervations of phyſicians it then appears, that this debility of the animal powers takes place near the time of the conjunction and oppoſition of the ſun and moon ; near the moon's perigee and apogee ; and in the ſame poſitions in which earthquakes and ſtorms more generally occur.

Of the reality of this effect of the elements on the body, there can be no rational doubts. About the time of the change of the atmoſphere, which indicates an approaching rain or ſtorm, perſons of debilitated habits of body, perceive the change, by a loſs of vivacity, dulneſs or heavineſs ; parts of the body that have loſt their natural energy by means of wounds and tumors experience painful or uneaſy ſenſations, by which ſtorms are often predicted.

Fowls perceive this change in the atmoſphere, and manifeſt their ſenſations. Candles ſparkle and ſnap; the tallow melts more freely, and the flame is leſs ſteady. Theſe things were obſerved by Ariſtotle and Pliny.

This change in the atmoſphere is not only perceptible by the ſenſe of feeling, but becomes viſible. Diſtant objects ſeen over water, and ſome writers ſay, over land alſo, *loom*, that is, riſe, or appear elevated, ſeveral degrees, above their uſual altitude. The ear alſo will aid us in foretelling rain and wind; for ſounds become audible at an unuſual diſtance.

Perſons in full health are not ſenſible of theſe changes in the elements; at leaſt, they are not ſo much affected, as to obſerve them. But from many years obſervation, I am convinced, that the catarrhal affections, which paſs under the popular name of *colds*, are occaſioned by the alterations in the atmoſphere which precede changes of weather, and few of them from the application of cold. I know this to be the caſe with myſelf; thoſe phaſes of the moon, which have been mentioned as producing great effects on the earth and atmoſphere, rarely paſs, without affecting me with ſlight catarrh. This has been remarkably the caſe, ſince the fever of 1798, which left me in a ſtate of debility. But many perſons can atteſt the truth of the principle; nothing being more common than for perſons to remark, that they cannot tell how they took cold; and it being well known that catarrhs are more general and ſevere, on the tranſitions from cold to heat, than from heat to cold. The obſtruction of the glands is evidently the effect of an inſenſible change in the atmoſphere, probably by means of the decompoſition of the electricity and the vapor or other elementary ſubſtances of the atmoſphere. And the winds to which we aſcribe the changes of weather are unqueſtionably an *effect*, rather than a *cauſe* of thoſe changes.

Theſe alterations in the atmoſphere appear to have ſome connection with the tides; or rather with the cauſe of tides. It is ſaid by ſeamen and other obſervers of the ſeaſons, that full tides are apt to produce rain; that rain which begins at high water will ceaſe, with the receſs of the tide; but rain beginning at low water, will be of conſiderable duration. Theſe and other obſervations, if juſt, manifeſt an influence of the tides over the ſtate of the atmoſphere, or a dependence of both on one common cauſe—the ſame inviſible energy of electricity producing both effects.

It is a known fact that the flowing tide often brings with it a breeze of wind. This is aſcribed to the friction of the water on the air, and the cauſe aſſigned may be ſufficient to account for the phenomenon. But it may be ſuggeſted whether the electricity of the atmoſphere, may not produce both the tide and the wind. The intumeſcence of the ocean, previous to earthquakes and hurricanes, which are evidently occaſioned by electricity, ſeems to bear a great analogy to the tides and to authorize my ſuſpicions. The ſwell of the ocean during earthquakes, has uſually been aſcribed to the raiſing of the land beneath it ; but this cannot be the cauſe, for ſuch a ſwelling of the land never takes place over whole continents. The ſwell of the water is probably the effect of the elaſtic powers of the electricity diſcharged, operating on the water itſelf.

There are many diurnal and periodical phenomena, which are evidently connected with the lunar and ſolar influence, and deſerve to be mentioned in this place.

It is a well aſcertained fact, that in the tropics, where the weight of the atmoſphere is ſubject to very ſmall variations, the barometer uniformly riſes and falls with the tides, about two thirds of a line. Encyclop. *art. wind.* This is a ſmall variation. But,

It is alſo aſſerted that, in thoſe regions, " the variations in the gravity of the atmoſphere ſeem to depend on the heat of the ſun, as the barometer conſtantly ſinks near *half an inch* every day, and riſes again to its former ſtation in the night." Encyclop. *art. atmoſphere.* [I ſuſpect the words " half an inch" to be an error.]

Now, if the barometer depends, for its fluctuations, on heat, we ſhould ſuppoſe the ſame cauſe would operate in northern latitudes, and occaſion a diurnal riſe and fall, in an exact ratio to heat and cold. In this caſe, a barometer would be a thermometer reverſed; riſing with augmented cold and ſinking with an increaſe of heat. But this is not the fact. The barometer often riſes with the increaſe of heat, between ſun-riſe and twelve o'clock. Heat therefore cannot be the direct cauſe of the diurnal depreſſion of the barometer in the equatorial climates; unleſs it has different laws, in different latitudes, which philoſophy will not admit.

Let us compare the facts ſtated with the known phenomenon of the different forces of water, during the day and the night. The water-wheel of any mill, the altitude of the water and the reſiſtance being preciſely the ſame, makes more revolutions, in a minute, during the night, than in the day time. I have long been acquainted with the fact, and it is known to every miller; but as I have never ſeen a ſtatement of it in any philoſophical work, I have had the curioſity to make an accurate experiment to aſcertain the difference. This was done on the night after the 28th of May 1799; the weather being perfectly ſerene, the air free from vapor, not a breath of wind ſtirring to ruffle the water, and the barometer, on the evening preceding, at half paſt eight, ſtanding at 30 and one tenth.

The firſt obſervation was made at a quarter before 7 P. M. ſometime before ſun ſet, the thermometer ſtanding at 65 deg. when the wheel of the mill made exactly 16 revolutions in a minute. The altitude of the water was marked with preciſion; but the delivery of the water not having been exactly adjuſted to the current entering the pond, the water roſe, and at 9 o'clock had half an inch of altitude beyond the mark. By this means, my obſervation at that hour was loſt. By raiſing another gate, the water was reduced to its former altitude, and by twelve o'clock the diſcharge of the water was exactly equal to the current, and from that time to ſunriſe, the altitude continued the ſame.

At twelve o'clock and from that hour to three, the wheel made 17½ revolutions in a minute; the obſervations being often repeated, without a ſenſible variation of reſults. Soon after three o'clock, a ſmall acceleration was perceptible, but it did not amount to half a revolution, until about half paſt three, when the wheel made 18 revolutions in a minute, which accelerated movement continued till half paſt four, when, being near ſun riſe, the obſervations were diſcontinued. During the laſt obſervations, I perceived a very ſmall retardation of movement, but it did not amount to half a revolution. To prevent any difference of reſiſtence in the mill, not the ſlighteſt alteration was made in the elevation of the ſtone, or the quantity of wheat delivered from the hopper, from the beginning to the end of the obſervations.

I had not a barometer with me at the mill, but about eight o'clock, on the following day, the barometer ſtood about one twentieth of an inch higher, than on the preceding evening. The thermometer fell, during the night, to 54 deg.

From this experiment, it is obvious that the weight of the atmoſphere could not be the ſole cauſe of the acceleration of the wheel. The acceleration at twelve o'clock was almoſt an *eleventh*—at a later hour, a *ninth* of the whole movement. The increaſed gravity of the atmoſphere will not account for a tenth of the difference.

We muſt then reſort to other principles for a ſolution of the phenomenon. It is commonly ſuppoſed that water is a noncompreſſible ſubſtance; but this opinion has been juſtly queſtioned. However this may be, I have little heſitation in reſolving the phenomenon of the water-wheel into its increaſed elaſticity during the night. How or why the ſubduction of light and heat ſhould produce or increaſe this property in water, I leave for electricians to determin. The effect cannot be aſcribed to the increaſed gravity of water, during the night, for no ſuch increaſe is obſerved.

It is an obſervation of ſeamen that ſhips make more way in the water, by night than by day, with the ſame force of wind. I ſhould ſuſpect that the moiſture on the ſails might, in a degree, contribute to this effect; but it muſt be recollected that in rainy days there is no difference in the moiſture of the air by night and by day. Can the effect then be aſcribed to the cauſe that accelerates the movement of water-wheels by night—an increaſed elaſticity? If the gravity and denſity of water were augmented during the night, theſe would render the water more buoyant, but retard the motion of a ſhip, by increaſing the reſiſtance. We are therefore driven to the ſame hypotheſis, an increaſe of elaſticity, which renders water more buoyant when at reſt, and more impreſſive when in motion, without an augmented denſity and weight. But I am not ſure that the moiſture of the air will not account for the whole effect.

If the elaſtic power of water is increaſed by the abſtraction of heat, does it not follow that this power muſt be greater as we recede from the equator ; and of courſe, any given force applied to the water in different latitudes, will occaſion a vibration of that fluid, proportioned to its elaſticity. Hence the ſmall tides within the tropics, where the heat is nearly uniform ; and the high tides in the northern regions, where the vibrations in the temperature of the atmoſphere, are more conſiderable. Yet facts do not permit us to aſcribe this elaſticity to cold. It is more probably owing to the quantity of electricity, or to its peculiar combination with aerial ſubſtances, of which cold is the effect. Perhaps the following obſervations will throw ſome light on this ſubject. Ariſtotle and after him, Pliny aſſerted that no animal dies, except during the ebb tide. "Nullum animal niſi æſtu recedente expirare. Obſervatum id multum in Gallico Oceano, et duntaxat in homine compertum." Pliny, Nat. Hiſt. lib. 2. 98. "No animal dies, except during the receſs of the tide. This is particularly obſerved on the coaſt of Gaul ; and is at leaſt true with reſpect to man."

The firſt part of this obſervation is probably too general ; but modern facts confirm the aſſertion, within certain limitations. A late miniſter at Barrie in Scotland, contiguous to the German ſea, made a ſimilar remark, after fifty years obſervation.

Sinclair, vol. 4. 240.

The reaſon why Pliny has ſpecified the coaſt of France, as remarkable for the fact ſtated, is very obvious. France lies on the main ocean, and the time of high and low water is the true time. On the coaſt of Italy, where there are no tides, the obſervation could not be made ; and if made by the time of ebb tide in rivers and bays, it would not be juſt.

Another remark made by phyſicians, is, that *cæteris paribus*, more perſons die during the latter part of the night, than at any other time in the ſolar day. This remark has not come to me from a ſufficient number of obſervations to command full belief; but it accords with a few obſervations of my own. If univerſally true, it would contradict in part the remark of Ariſtotle and Pliny; but it is poſſible, both remarks may be true with certain limitations. The fact may be more obvious, when ebb tide happens between midnight and ſunriſe; and leſs ſo, when flood tide happens at that period; that is, under the combined or ſeparate operation of the two cauſes.

Other facts lend their aid to ſupport the obſervation that ſome eſſential change in the properties of the atmoſphere takes place, in the latter part of the night. This is the time when all fevers remit or intermit. The exacerbations and paroxiſms of fever invade the patient, during ſome part of the day, and ſubſide in the latter part of the following night.

Again. The chills that precede fevers uſually come on in the ſame part of the day, that is, between midnight and ſunriſe. This is remarkably the caſe with epidemic diſeaſes, as all phyſicians agree. The fact has been aſcribed to the debility induced by ſleep; but I ſuſpect it is owing to the debility induced by the ſame change in the ſtimulant powers of the atmoſphere, which occaſions the other phenomena before mentioned.

It is obſervable alſo that ſleep, in the latter part of the night, is more ſound, than at other times; an effect perhaps of the ſame cauſe.

Lind obſerves that in the Eaſt-Indies, patients generally expire at low water—the ſame fact is obſervable at the full moon—and convaleſcents uſually relapſe at theſe periods. See his Treatiſe on the diſeaſes of hot climates. p. 86.

From experience I can teſtify that relapſes uſually occur, at thoſe periods of the lunar month, when changes of weather take place.

Ulloa was careful to note the time of the tide when earthquakes occurred in South-America, and he found them invariably to happen at half ebb or half flood—never at high or low water.

Voyage, vol. 2. B. 7. Ch. 7.

There are other periodical changes in the atmoſphere which deſerve notice. Great ſtorms of wind, ſnow and rain, uſually begin, abate and ceaſe at certain hours, viz. at ſix, nine, twelve and three o'clock; eſpecially at ſix and twelve. To this remark there are very few exceptions.

Experienced accoucheurs inform me that in lingering caſes of child-bed illneſs, paroxiſms of pains recur at the ſame hours.

What is ſtill more extraordinary, we are aſſured by unqueſtionable authority, that in volcanic eruptions, the diſcharges are more violent at theſe hours, than during the reſt of the day. Sir William Hamilton, in his excellent account of the great eruption of Veſuvius, in June 1794, has the following paſſage. "The fever of the mountain, as had been remarked in former eruptions, ſhowed itſelf to be, in ſome meaſure, periodical, and was generally moſt violent, at the break of day, at noon and at midnight."

Univ. Magazine for Auguſt, 1795.

Theſe are the hours when we obſerve great changes in the atmoſphere, and ſudden effects on the human body in diſeaſes. The break of day is preciſely the time when the water-wheel is moſt accelerated—when fevers remit or intermit, and when the patient, lingering under diſeaſe, ſuddenly yields, and ſinks into his grave.

To what cauſe ſhall theſe effects be aſcribed? Not to lunar or ſolar attraction, in the uſual ſenſe of the word. Attraction is conſidered as a ſteady principle operating uniformly under the ſame circumſtances; and therefore the attraction of the moon, whoſe poſition in regard to the earth is every day changed, cannot account for periodical phenomena, at certain hours in the day. The influence of the ſun will better ſolve the phenomena; but how can the ſame principle, attraction, operating by uniform laws, produce the ſame effects at two oppoſite hours, for inſtance at noon and at midnight, which certainly is the caſe in regard to the exacerbations of volcanic eruptions, as well as in regard to the commencement, abatement, and termination of ſtorms?

I do not know that any principle yet diſcovered will ſolve the difficulty. But the phenomena bear a greater analogy to the operations of electricity, than to any other principle in nature hitherto diſcovered. It ſeems neceſſary to invite to our aid repulſion as well as attraction, producing in oppoſite points, the ſame effects. The nature and operations of electricity are little underſtood, and probably will never be brought wholly within human comprehenſion.

It is to be wiſhed that experiments on the revolutions of waterwheels, in different latitudes, may be made, with care and preciſion, to aſcertain whether any acceleration at night takes place within the tropics, and if ſo, whether it equals the acceleration, in northern latitudes. And alſo whether the acceleration is greater in the latitude of 60 deg. than in the latitude of 40 deg. Our millers ſay that water has more force in winter, than in ſummer. This may be eaſily aſcertained by experiment

We are enveloped in a maſs of fluids, whoſe combinations are in a continual proceſs of change. The energy of action ſeems to depend on electricity—or the principle of light, heat and fire; but I am perſuaded that the manner in which changes are produced, is very little underſtood.

I will cloſe this lengthy article by obſerving that the phenomena of lunar and ſolar influence are ſo well underſtood and clearly proved, as to juſtify in our minds, the great attention which the ancients paid to the influence of the planets on this globe. If they went into one extreme, by aſcribing too much to that influence, the moderns have erred, on the other extreme, by holding their doctrins in contempt.

The ſun is the great ſource of light, and his rays excite the heat which exiſts in and around the globe. It moves this univerſal principle, which conſtitutes the energy of the material ſyſtem, under the control of infinite intelligence.

The moon is placed in the vicinity of the earth, to give variety to the ſeaſons, and by acting on the elementary principle of heat, ſhe occaſions the viciſſitudes of rain, ſnow, fair, calm and tempeſtuous weather. The changes which precede and produce theſe viciſſitudes appear to be variations in the combinations of heat or electricity, with the other elemental principles of the atmoſphere. Theſe modifications of the atmoſphere, without any acceſs of new matter or diminution of its maſs, produce differences in its denſity and elaſticity, with all their various effects on the animal and vegetable ſyſtems. Hence a mere modification or new combination of electricity, with vapor or other aerial ſubſtance, may increaſe or diminiſh its ſtimulus—during the day, it may excite fever in the human body; during the night, a ſubduction of excitement in the atmoſphere, may induce debility, and favor the invaſion of diſeaſe and the approach of death. Theſe are mere hints and conjectures, intended to excite inveſtigation.

With reſpect to the ſuppoſed influence of comets on the elements of this globe, I would remark, that on the principles here ſuggeſted, that influence is very clearly proved and may be eaſily underſtood. The facts ſtated demonſtrate that the ſun and moon exert great powers on the globe; and the fact that earthquakes moſtly happen in certain poſitions of the moon, prove that the *medium* of her influence is the electric principle.

Now comets are known to be of various magnitudes. Some of them are as large as Venus; much larger than the moon; with highly electrified atmoſpheres; and ſometimes approaching near to the earth. The comet of 1577 came within leſs than a million of miles diſtance.

Thoſe comets which paſs the ſyſtem at an immenſe diſtance from the earth can have no great influence; but others approaching near, produce tremendous effects. Hence during their proximity to the earth, the number and violence of earthquakes and volcanic diſcharges; tempeſts, inundations from rains and extraordinary tides; and moſt ſenſible changes in the powers of animal and vegetable life. That ſuch are the effects, is proved not only by the concurring opinions of all the ancient philoſophers, who were accurate obſervers of nature, but by one uniform ſeries of hiſtorical evidence, for more than two thouſand years. On the principles of electricity, which is diſturbed, attracted, repelled and modified in its combinations with other ſubſtances, by the approach of diſtant bodies, the ſolution of the phenomena is eaſy and philoſophical.

Of Electricity.

SOME modern philoſophers ſuppoſe that the earth contains vaſt quantities of fire, which is the ſource of the principal part of the heat on the earth, the cauſe of vegetation, of earthquakes and volcanic eruptions, and of hot ſprings.

See Buffon, and Darwin's Botanic Garden. Additional Notes, p. 145. New-York edition.

There are ſome reaſons to believe that particular parts of the earth abound with fire, or maſſes of burning lava. This opinion is ſupported by the iſſuing of ſmoke from the craters of certain volcanoes, for years in ſucceſſion, without any eruption of fire.

But the theory which aſcribes earthquakes to ſteam or vapor, appears to be very unſatisfactory. How can ſteam be collected within the bowels of the earth, ſufficient to ſhake a continent of 3000 leagues in extent? If a great quantity of water ſhould by accident fall on a maſs of burning lava, the effect would not be a general equable ſhake or concuſſion, over a whole quarter of the globe, which ſometimes happens in earthquakes; but a violent ſhake at the place of contact, and a diſrupture of the earth, by which the force of the ſteam would be ſuddenly diſcharged into the atmoſphere. This however is not the fact. Almoſt all earthquakes in North-America are progreſſive; beginning in the interior of the country and proceeding towards the ocean, in a direction perpendicular to the line of ſhore, that is, from north-weſt to ſouth-eaſt. Perhaps we can find a ſatisfactory ſolution of this phenomenon, upon electrical principles; but no cauſe can be found in the known properties and effects of ſteam.

One of the arguments uſed to maintain the theory of ſteam, is derived from the known fact that ſprings and ſtreams are uſually exhauſted by extreme drouth, ſome time antecedent to earthquakes and volcanic eruptions. But the fact, inſtead of ſupporting the theory, operates to deſtroy it.

The hypotheſis ſuppoſes that, at certain times, the ſprings in the vicinity of burning lava deſcend and fall upon it; and the water being raiſed into ſteam and extremely rarefied, expels the burning materials in volcanoes with great violence; and in earthquakes, the force of the ſteam alone aſcends and ſhakes the earth.

But why ſhould the water of the ſprings find paſſages to the lava, at ſome times and not at others? If the paſſages were always open, the water would always deſcend. If they are open at particular times only, there muſt be ſome ſubterraneous force exerted to open them, before the water comes in contact with the fire; the effect then or diſrupture, muſt take place, in a certain degree, before the ſuppoſed cauſe can operate. Conſequently the force exiſts anterior to the diſrupture which brings the water in contact with the fire. This concluſion ſuperſedes the uſe of vapor.

But by what magic does it happen that all the ſprings and rivers in the neighborhood of a volcano for inſtance, diſappear about the ſame time? By what mutual conſent, can this remarkable phenomenon be produced? And why, after the eruption, do all the ſprings and rivers reſume their former channels? Is it poſſible to ſuppoſe thouſands of paſſages, ſcattered over many leagues of earth, to be all opened at once, to convey ſubterranean ſprings to a particular place, a few months anterior to an eruption of fire; and after the eruption, to be all cloſed at once and the water compelled to run in its former channels? Yet all this muſt be admitted on the theory of ſteam.

That large volumes of water are ſometimes thrown into the baſons of volcanic mountains and ejected, is true; but, in ſuch caſes, the diſrupture is occaſioned by a previous earthquake or force of fire, and the water is diſcharged in maſs; not in the form of vapor.

It is a fact authorized by all hiſtory and obſervation, that great earthquakes and volcanic eruptions are often, if not uſually, preceded by ſevere and univerſal drouth. This drouth often extends over whole continents; and I find that the defects of water which occaſion the terrible famins in Egypt, India and China, of which we have many accounts, happen generally, (and I ſuſpect always,) a few months before and during ſome great diſcharges from volcanic mountains. I have certain evidence that this failure of rains and ſprings ſometimes occurs ten months before the eruption. This was the fact in Bengal in 1769—and in America in 1762 and 1782. At other times, the drouth happens during the eruption, and in ſome caſes, it is continued for two or three years, in which eruptions take place in different parts of the world.

The drouth, on ſuch occaſions, is not occaſioned ſolely by a failure of rain, but by the concurring influence of exceſſive evaporation. This fact is capable of demonſtration. Sir William Hamilton, Univ. Mag. Aug. 1795, in his account of the eruption of Veſuvius in 1794, informs us that ſome days previous to the diſcharge, the great fountain at Torre del Greco began to decreaſe, ſo that the corn-mill worked by it moved ſlowly. In the wells of the town, the water fell and it was neceſſary to lengthen the ropes daily. Some wells became quite dry. In a vineyard, near the town, ſome perſons were alarmed, eight days before the eruption, by a ſudden puff of ſmoke and exploſion from the earth.

It is recorded that Pherycides foretold an earthquake in Greece, from a ſudden failure of water in a well. Theſe facts indicate unuſual evaporation.

It is obſervable alſo that the exhauſtion of water extends, in ſuch caſes, to a greater depth than uſual. The earth, below the uſual influence of the ſun's heat and of rains, loſes its natural moiſture. Such probably was the caſe in 1782, when the cedar ſwamps in New-Jerſey took fire and burnt to the depth of many feet. And this is probably what Livy meant, when, in ſpeaking of the terrible drouth in Rome, before the great eruption of Etna, B. C. 426, he uſes the words "ingenito humore egens"—a failure of native moiſture.

In the vicinity of volcanoes, this evaporation may be accounted for on the principle of ſubterranean heat, which is ſenſibly increaſed, ſome time before an eruption. But this ſolution cannot apply to countries a thouſand leagues diſtant, which ſuffer extreme evaporation, at the ſame time.

There appears to be no way to account for the phenomenon but by the great principle of action, electricity. Indeed the diſcovery of the fact, that moſt earthquakes happen under particular phaſes of the moon, and that volcanic eruptions are obviouſly affected by her poſition in her orbit, ſeems to place this point beyond queſtion.

It ſeems then to be very certain that the electricity which exiſts in and about the earth is eſſentially influenced by the ſun, moon and planets, but eſpecially by the larger comets; which paſs near the earth. The influence of theſe bodies, or the eſſential laws of the univerſe, diſturb this fluid and vary its diſtributions and its combinations with other ſubſtances.

Previous to earthquakes, volcanic diſcharges and hurricanes, it is evident from many phenomena already enumerated, the electricity of the earth paſſes out of it in unuſual quantities; and as the air is often a bad conductor, the fluid attaches to it and carries along, the water upon the ſurface and within the bowels of the earth. This proceſs continued for ſome weeks and months, exhauſts all the rivers and ſprings. The atmoſphere, in the mean time, becomes more and more dry, and a worſe conductor, until both air and earth become perfectly electric, or non-conductors. In this ſituation, either a great demand for the fluid in ſome diſtant region, or a great accumulation of it in the bowels of the earth, has prepared the way for a ſudden exploſion, but no conducting medium exiſts, ſufficient to convey it. A fall of rain, at this time, may create that medium; and hence the common fact that earthquakes happen ſoon after rain, ſucceeding ſevere drouth. If no rain falls, the fluid accumulates, till it forces a paſſage through the great apertures, formed for the purpoſe, the volcanic mountains, ſetting fire, on its way, to the hydrogene, and other inflammable ſubſtances, which the ocean generates or depoſits in their boſoms.

I know not that theſe concluſions are juſt, but the facts from which I reaſon, are indiſputable. The uncommon diſcharges of electricity, *previous to theſe great concuſſions*, are indicated not only by the exhauſtion of ſtreams and ſprings but by many phenomena in the atmoſphere, ſhowing it to be highly electrified. Meteors, huge globes of fire, ſhoot through the air, not only after, but *before* the eruption. Witneſs the meteors of 1758, 1762, and one in May 1783, mentioned in the preceding hiſtory. And Sir William Hamilton informs us that the air was unuſually charged with electricity, ſome days before the eruption of 1794.* Unuſual halos and mock ſuns, fiery and luminous appearances in the heavens, with extraordinary tempeſts, and hail, are evidences of the ſame fact.

The idea that the heat which we experience exiſts in and about the globe, is undoubtedly well founded. The ſun is probably the great electric of the ſyſtem, which excites into action the heat of the atmoſphere and the earth ; but there is no reaſon to believe that heat is principally derived from that body. The ſolar rays conſtitute a very ſmall part of the heat of the earth ; but they excite it by the rapidity of their motions, or by decompoſing that which exiſts in the air and earth.

Hence there appears to be little foundation for the opinion, that the inferior planets which are neareſt to the ſun, have more heat, than Saturn and Jupiter. If heat is diminiſhed in the ratio of the ſquares of the diſtances from the ſun, it is on the principle that heat conſiſts in ſolar rays ; but this is a very queſtionable doctrin. Light is a ſubſtance, but does not neceſſarily contain heat ; at leaſt not any that is perceptible.

It is probable, that if the ſolar rays falling on Saturn are diminiſhed in number, according to the doctrin of diverging lines, that this defect is ſupplied by an increaſe of denſity or ſuſceptibility of excitement, in the atmoſphere of that planet. The denſity and capacity of being excited may be in a direct proportion to the ſolid contents of the planet, or in a duplicate ratio to the diſtance. Hence the larger planets are placed at the greater diſtance. And on this principle there is no ground to calculate, as Newton has done, the extreme heat which comets acquire in their perihelion. No ſubſtance of which we have any knowlege, could ſuſtain the intenſity of heat which, he has calculated, the comet of 1680 muſt have received. It is more conſonant to the general arrangement of the univerſe, as far as our limited underſtandings can comprehend it, to ſuppoſe none of the great orbs that roll in infinite ſpace, are either over heated or over cooled. Every orb has probably its own fund of heat, and the capacity of being excited, ſuited to its place and deſtination. The planets, the comets in the parts of their trajectories moſt remote from the ſun, and even the ſun itſelf, may be inhabited.*

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* May not the appearances of certain epidemic diſeaſes of inflammatory diatheſis be aſcribed to this too highly electrified, and of courſe, ſtimulant ſtate of the atmoſphere ? The influenza of 1708 was preceded by a meteor or fiery globe. In 1758 was a meteor and the meaſles began in America. In 1771 a meteor, and then commenced influenza and meaſles. In 1775 a meteor, and the cynanche maligna prevailed.* In 1783 two meteors, and then commenced meaſles and ſcarlatina anginoſa. In 1788 a meteor, and immediately began the meaſles. If theſe coincidences are all the work of chance, they are certainly a very ſingular kind of accidents. More facts and obſervations than I poſſeſs are neceſſary to ſettle this queſtion.

* *In America; and in Europe, influenza.*

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* I take this opportunity, in diſcuſſing the queſtion concerning the origin of heat, to notice what philoſophers have ſaid on the ſubject of the internal heat of the earth. Darwin, in his Botanic Garden, note 6, alleges the earth below the depth of about ten feet, to be always of the ſame temperature, which is 48 deg. by Farenheit. He cites Dr. Franklin's obſervation, that ſpring water at Philadelphia is of 52 degrees, which, he ſuppoſes, a proof of internal heat from central fires. For as the climate of North-America is colder, than that of England, he could not account for the exceſs of heat in the water at Philadelphia, beyond that of England, but by preſuming it to be occaſioned by internal fires. Yet in another paſſage, in note 7, the author intimates that he had an idea of a difference of heat in different latitudes, derived from the action of the ſolar rays. Yet I cannot find any European author who appears to have had a correct idea of this ſubject; and Mr. Jefferſon, in his Notes on Virginia, query 5, has manifeſted his ignorance of it, by a moſt egregious miſtake. Speaking of a cave in Frederick county, he informs, that the thermometer, which ſtood at 50 deg. in the open air, roſe to 57 deg. in the cave. He then adds the following remark, "The uniform temperature of the cellars of the Obſervatory of Paris, which are 90 feet deep, and of all *ſubterranean cavities* of any depth, where no chymical agents may be ſuppoſed to produce a factitious heat, has been found to be 10 deg. of Reaumer, equal to 54½ of Farenheit. The temperature of the cave above mentioned ſo nearly correſponds with this, that the difference may be aſcribed to a difference of inſtruments."

It ſeems a little ſtrange that ſo groſs an error ſhould have paſſed uncorrected, till this late age, on a point of fact ſo eaſy to be aſcertained.

The truth is, the temperature of the earth, below the diurnal and annual influence of the ſolar rays, which may be perhaps ten feet in ſolid earth and 30 feet in open wells, is regulated by the proximity of place to the equator, ſubject to ſmall variations, from the poſition of the place in regard to the ocean and the height of the land.

But what is remarkable, this temperature of the earth and water in the interior of the globe, is preciſely the *mean temperature* of the climate, in the place where the obſervation is made. Thus, let the higheſt and loweſt points be taken daily by any good inſtrument, and divide the

In a knowlege of mathematics and the application of mathematical principles to the material ſyſtem, Newton is, and probably will forever be unrivalled. But modern philoſophers enjoy the benefit of many diſcoveries made by experiments and by collections of facts, which give them an eminent advantage over the great aſtronomers of the laſt century. The ideas of Newton in regard to the tails of comets ſeem to have no juſt foundation, and to be utterly repugnant to his own principles of the powers of

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ſum of all the obſervations by the number of days in the year, the quotient will be the mean temperature of the climate, and preciſely the temperature of the water, below the variations of heat and cold. If any difference ſhould be found, it muſt be owing to inaccuracy in the obſervations. It is more uſual to take three obſervations daily; at 2 o'clock P. M. the warmeſt time in the day, at ſun-riſe the coldeſt time, and at ſun-ſet, which is found to be the mean temperature. By obſervations made in the city of New-York for one year, I found the mean temperature to be 53½; but this is 1½ degree too high; owing to an exceſs of heat *within the city*, beyond the general temperature of the climate. The air in a city cools leſs at night, than in the country, and hence the morning obſervations were found to be too high. In many inſtances, ice as thick as glaſs was formed a mile from New-York, when an accurate thermometer in the city fell no lower than 40 deg. Hence the great error of determining the temperature of a climate, by obſervations made in a large city; which is often done in Europe.

The mean temperature of the climate in England, is 48 deg. That of Paris, 54½. This difference is owing to the inſular ſituation of England; the atmoſphere in the vicinity of large tracts of water being always more temperate, than on continents at a diſtance from the ſea or great lakes.

The following is the mean temperature of the climate of the reſpective places, aſcertained by obſervations.

London, north latitude,	51°	30	temperature,	48°
Paris,	48	50		54½
Quebec,	46	48		42
Rutland, (Vermont,)	43	34		43½
Salem, (Maſſachuſetts,)	42	30		47
Hartford, (Connecticut,)	41	44		49½
New-York,	40	42		52
Philadelphia,	39	56		52½
Virginia, (Frederick,)	39	nearly		57
Charleſton, (S. C.)	32	44		66

Allowing a trifle for differences of inſtruments, this table preſents to view the various mean temperatures of the climates mentioned.

From this table naturally ariſe two obſervations. Firſt the great difference between the climate in Europe and America, under the ſame parallels of latitude. Thus London in 51 degrees north, has a mean temperature, almoſt as mild as Hartford in 41. Paris in the 49th degree has a climate, nearly as mild as the northern parts of Virginia in the 39th, and warmer than New-York and Philadelphia in the 40th.

Again we obſerve the great effect of the ocean upon the climate. Salem in Maſſachuſetts is upon the ſea ſhore, and Rutland, in Vermont, fifty or ſixty leagues diſtant; and one degree of latitude differ-gravity and reſiſtance. He ſuppoſed them to conſiſt of vapor or ſmoke repelled from the nucleus by the force of the ſun's heat. He ſeem to have been aware of the objection to this theory from the reſiſtance that muſt be made to the aſſent of the vapor, by the celeſtial ether ; and therefore ſuppoſes an extreme rarefaction to take place, which removes that reſiſtance.

But whatever rarefaction may be ſuppoſed, ſtill it will remain an incontrovertible principle in phyſics, that no ſubſtance that has *gravity* can be ſupported, but in a medium which has *more gravity*. The vapor ſuppoſed in the preſent caſe could not be maintained in ſtrait lines, without a medium of greater denſity to ſupport it. Now, any medium capable of ſupporting vapor muſt furniſh great reſiſtance, and very much retard its velocity.*

With theſe known principles in view, let any man calculate the velocity of vapor, driven from the nucleus of a comit, neceſſary to preſerve a direction nearly oppoſite to the ſun, in its perihelion paſſage.

Comets enter the ſolar ſyſtem in various directions ; the planes of their orbits making various angles with that of the ecliptic. Their orbits are nearly elliptical, and the ſun is in one of the foci of the ellipſis.

By the univerſal law of planetary motion, according to which all revolving bodies deſcribe equal areas in equal times, the mo-

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ence in the poſition of the places; yet the climate at Rutland is 3½ degrees colder than at Salem. On the other hand, Quebec, remote from the ſea, tho on a river, with three degrees difference of northern latitude, has a difference of only 1½ degree in climate.

To aſcertain the mean temperature of any given place, it is only neceſſary to plunge a good thermometer into water, taken from a depth, in which the temperature is uniform, at all ſeaſons of the year.

The mean temperature of water within the tropics is not exactly known, but it muſt be very near 80 deg. by Farenheit. Water drawn from a depth of 200 feet in the Weſt-Indies, is *cooled* by filtration in the air, above the earth in thoſe hot regions.

The difference in the temperature of Europe and America under the ſame parallels, is nearly that of ten degrees of latitude.

See Holyoke's Regiſter of the weather, Mem. Am. Acad. vol. 2. part 1.
Williams' Hiſt. of Vermont.

* I ſubmit it to mathematicians whether on Newton's own principles, an atmoſphere of denſity ſufficient to ſupport a cannon ball, would not retard its velocity, as much as the preſent atmoſphere does a feather put in motion. If ſo his rarefaction does not in the leaſt aid the aſcent of vapor from the body of a comet.

tion of comets muſt be very rapid in their perihelion. The comet of 1770 was calculated to deſcribe an arch of 50 degrees in 24 hours. This ſeems hardly credible ; but many comets deſcribe an arch of 180 degrees, a ſemi-circle, in 30, 40, or 50 days.

The perihelion diſtances alſo of the various comets are very different, and ſo are the lengths of their tails ; ſome of them extending a ſmall diſtance, and others to 60 and 80 millions of miles.

Suppoſe the perihelion diſtance to be 30 millions of miles, and the length of the coma to be 70 millions. In this caſe the extremity of the tail muſt be 100 millions of miles from the ſun. Now, either the vapor which is ſuppoſed to conſtitute the tail, muſt be ſhot from the nucleus with ſuch rapidity, as to reach the extreme point of the coma, in a few hours ; that is, it muſt paſs through 70 millions of miles, in a very ſhort time, to preſerve a direction nearly oppoſite to the ſun ; or the whole coma muſt move forward with the nucleus. In the latter caſe, the extremity of the coma muſt paſs along the periphery of a circle,* whoſe radius is a line from that point to the ſun, or 100 millions of miles. Of courſe while the comet deſcribes an arch equal to a ſemi-circle, the extremity of the coma muſt paſs through the ſpace of 150 millions of miles. I believe no kind of vapor of which we have any knowlege, could perform either of theſe journeys in the time given.

On the other hand that gravitating ſubſtance would not have paſſed thro the diſtance ſuppoſed, from the creation of the world to this time.

On ſubjects of this kind, we cannot arrive at certainty. All we can do is, to reaſon from analogy and from probable conjectures. We know of no ſubſtance in creation, capable of producing the phenomena of the comas of blazing ſtars, except electricity or light. No other ſpecies of matter paſſes with a rapidity that will ſolve the phenomenon of the length of the coma preſerved in a direction oppoſite to the ſun. The theories of Kepler and Hamilton are more rational, than that of Newton. The tails muſt conſiſt of electricity repelled from the nucleus by the force of the ſun; or muſt be merely the rays of light colored by their paſſage thro the comet's atmoſphere. Theſe hypotheſes may not ſolve *all* the phenomena; but they will account for the principal; and are repugnant to no philoſophical principles,

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* The figure would not be a circle, but it is not material to the argument.

The curvature of the coma has been alleged as an objection to this hypotheſis. But in fact this is a confirmatory argument in favor of it; for it is analagous to the curvatures formed by aſcending ſtreams of electricity in the lumen boreale; indeed it ſeems to be a law of electricity to move in bending lines; and for any thing we know, this phenomenon may reſult from the nature of that ſpecies of matter, and be independent of reſiſtance.

In regard to the tranſparency of the tail, it reſembles alſo the lumen boreale. Thro both of theſe luminous appearances, the ſtars ſhine with undiminiſhed luſtre; but vapor, however rare, would refract their light, and in a certain degree, interrupt our viſion.

An Eſſay on Comets by Andrew Oliver, publiſhed 1772, aſcribes the tails of comets to air extremely dilated and repelled from the nucleus by the power of the ſun; but this hypotheſis is liable to all the objections ſtated againſt the theory of Newton.

My own opinion reſpecting the material ſyſtem, is this; that an atmoſphere, the baſis of which is electricity, fills infinite ſpace and involves in its boſom all the ſolid orbs which ſhine in the celeſtial regions. This may be denominated the *mundane atmoſphere.* My hypotheſis reſts on the following reaſons.

Firſt. The large meteors or globes of fire are formed in regions far beyond the limit aſſigned to the earth's atmoſphere. Their altitudes vary from 40 to 80 miles. At the height of 80 miles, then, there muſt be the matter of an atmoſphere, capable, of generating globes of fire of half a mile in diameter; and of communicating ſounds, as full and diſtinct, as the air near the earth; for the exploſion of one of thoſe globes reſembles thunder.

Secondly. The lumen boreale has been often calculated to be viſible at an elevation of 7 or 800 miles. I do not rely on the accuracy of theſe calculations, on account of the difficulties attending them. In ſome inſtances we are very certain that this light exiſts in the regions of the higher clouds.

Thirdly. The tails of comets muſt be matter, or depend on matter for their coloring by which they become viſible. In either caſe we have evidences nearly amounting to demonſtration that a material atmoſphere fills the boundleſs regions of ſpace.

Fourthly. But an argument of ſtill more weight in my mind, is one drawn from the neceſſity of ſuch an atmoſphere, as the medium of attraction and repulſion—the principles that connect and bind together the vaſt orbs that roll in etherial regions. I can have no idea of ſuch an immenſe power exerted in an immenſe void or vacuum.

It ſeems probable that the parts of our atmoſphere which conſtitute weight, and are ſuppoſed to influence the barometer, are limited to the diſtance of a few miles from the earth. Water, for inſtance, is a ſubſtance deſtined to anſwer certain purpoſes on the globe, and is probably confined to its neighborhood.

But the principle of electricity may be, and undoubtedly is, a nongravitating and permanently elaſtic ſubſtance. This may be diffuſed through infinite ſpace, and by its amazing elaſticity, may be capable of communicating motion or force from planet to planet, with the rapidity of light.

Newton ſuppoſed infinite ſpace to be filled with a ſubtle ſubſtance which he called *ether*. Had this great man been acquainted with the laws of electricity diſcovered ſince his days, he probably would have exchanged the term ether, for *electricity*.

By means of this powerful principle, the planets all influence each other ; and become the means of diverſifying each other's ſeaſons ; ſometimes by attracting, ſometimes by repelling, and ſometimes diſturbing the proportions of this ſubſtance, or influencing its mechanical laws, by which it is combined or decompoſed with other atmoſpheric ſubſtances.

Hence we may account for the frequency of earthquakes, volcanic eruptions and violent tempeſts, under particular phaſes of the moon, and eſpecially during the proximity of comets. The electrical matter accumulated in the earth by its own laws, or by reaſon of an unuſual demand ab extra may, during the approach of theſe orbs, be ſuddenly called into action, and occaſion extraordinary tumults in the atmoſphere.

Perhaps alſo we may, in this hypotheſis, find a ſolution of the phenomenon, ſo intereſting to man, and ſo myſterious, why the approach of comets never fails to be attended with epidemic diſeaſes. The fact, in regard to comets which come near the earth, is unqueſtionable ; and it is equally certain that earthquakes, volcanic eruptions, meteors and many other electrical phenomena, are, at ſuch times, more numerous and violent, than at other times.

Now it is proved by experiments that the fibres of living animals are the moſt perfect conductors of electricity, while the integuments which cover them are non-conductors. A conſequence of theſe principles muſt be, that in all the motions or operations of electricity in the atmoſphere, the nerves muſt be the principal ſubjects of its influence. Hence if the atmoſphere is, at times, electrified beyond the degree which is uſual, and neceſſary to preſerve the body in a due ſtate of excitement, the nerves muſt be too highly excited, and under a continued operation of undue ſtimulus, become extremely irritable, and ſubject to debility. Shall we not find, in this hypotheſis, a rational ſolution of the phenomenon which has puzzled medical men, the exceſſive irritability of the nervous ſyſtem, in times of epidemic diſeaſes, which facilitates the invaſion of fever ? Shall we not account for the eruptive diſeaſes which always precede peſtilential epidemics, on the principle of the great debility of the extreme veſſels, induced by the weakneſs of the nerves which ſpread over the human body near the ſurface, by which means theſe veſſels are rendered incapable of performing their uſual ſecretions ? Shall we not be able to account for the remarkable coincidences in time between the influenza, and unuſual electrical phenomena, as volcanic eruptions and earthquakes ? May we not account for epidemic meaſles, in thoſe years when the atmoſphere ſhows evidences of high electrification ? And will not this principle explain the diſeaſes among animals, the defect of vegetation, and the extraordinary generation of inſects, during peſtilence ? It is well known that vegetation may be greatly accelerated by artificial electricity. Is this effect produced by what is called *ex-*

citement? And if ſo, how do we know that a ſimilar power, operating on the elements, may not call into exiſtence innumerable inſects? To what other principle ſhall we aſcribe the *unuſual ſize* of common inſects, when they precede and accompany peſtilence, a fact well atteſted? There muſt be a cauſe for theſe phenomena, and where ſhall we find it, but in the univerſal principle of excitement?

It is now agreed among philoſophers that electricity is the immediate agent in the formation of rain, ſnow and hail. In confirmation of this theory, my enquiries into the cauſe of epidemic diſeaſes have led to a diſcovery, that thoſe years when volcanoes diſcharge great quantities of fire and lava, including ſome months before and after the diſcharges, are by a great difference, moſt productive of hail. Hence the immenſe damage done by hailſtorms in thoſe ſeaſons which are exceſſively dry and hot; theſe years being cloſely attendant on volcanic eruptions. The theory which aſcribes hail to extreme cold is defective. We know that pieces of ice of three, ſix and even nine inches in circumference ſometimes fall in hail-ſtorms. By the laws of gravity, a hailſtone muſt begin to fall, as ſoon as it begins to be formed; and as it requires but a few ſeconds to deſcend, it is eaſy to conceive that mere cold cannot occaſion a congelation rapid enough to form pieces of ice of half a pound weight. The proceſs is electrical, and almoſt inſtantaneous; and we know that real ſnow may be artificially and inſtantly produced by means of condenſed air and electricity. Hence we are led to the cauſes which connect ſevere winters with volcanic eruptions; we derive the extreme heat of ſummers and cold of winters, which ſo generally accompany peſtilence, from the ſame cauſe, a ſuperabundance of electricity.

Hence we are led alſo to the cauſe of the apoplexies, lethargies and eruptive diſeaſes, which almoſt uniformly follow great volcanic diſcharges and earthquakes in Italy. The ſyſtem, and eſpecially the nerves, are exceſſively excited, and loſe their energy.

It is on the ſame principle alſo that we explain the phenomena of freezing, when the thermometer is above the uſual point of froſt. This has been obſerved near volcanic mountains, where the atmoſphere is highly charged with electricity. In 1730, Dr. Cyrilas found by a thermometer made by Haukſbee, that water, near Veſuvius, froze with the mercury 10 degrees above the freezing point.

Phil. Tranſ. No. 424. Bad. Mem. vol. 9. 299.

The nature of this element, electricity, is little underſtood. It is the modern opinion that heat and light are only modifications of the ſame element. This is analogous to what we know of water, which exiſts in the form of water, of viſible vapor and air.

It is ſuppoſed that electricity cannot be inſulated in the human body. But if it cannot be inſulated in the form of *electricity*, may it not in the form of *heat*, and thus be the direct cauſe or matter of inflammation? If it can be accumulated and inſulated in this form, may not conductors be formed to draw it off in the form of electricity? Mr. Vinal relates that he ſpeedily removed local inflammation occaſioned by a burn and ſcald, by the application of a negatively charged electrical machine.

Mem. Amer. Acad. vol. 2. 144.

Should this doctrin be well founded, the ſucceſs of metallic points in removing topical inflammation, will be explained and eſtabliſhed.

The proofs of the altitude of the atmoſphere from the power of refracting light, are now known to be fallacious. No man will ſuppoſe the atmoſphere to be leſs elevated, in the equatorial regions, than in the polar circles; yet the duration of twilight, under the equator, being leſs than in places remote from it, proves that the power of refraction will not determin the height of the atmoſphere. The power of refraction is in a ratio to the diminution of heat, or increaſe of cold, in the atmoſphere; or perhaps to the increaſe of electricity.

Nor will it be correct to ſay that the power of refraction depends on the denſity of the atmoſphere, unleſs denſity can exiſt independent of gravity. The atmoſphere in the polar and temperate regions raiſes the barometer no higher, than under the equator; nor is the mercury in barometers generally higher in winter, when the thermometer, by Farenheit's ſcale, is 10 degrees under cypher, than in ſummer when it is at 98 deg. the temperature of blood heat.

If denſity implies or involves in it gravity, then the atmoſphere at the equator is as denſe as in any diſtant latitude, for the barometer is as high in one as in the other. But if the atmoſphere is as denſe and as heavy, cæteris paribus, in one latitude, as in another, then the powers of refraction, in different latitudes, which are various, cannot depend on denſity.

It is indeed very queſtionable whether denſity and gravity are the principles which wholly influence the barometer. The barometer falls, as it is elevated above the ſurface of the earth; but the atmoſphere retains all its powers of ſuſtaining reſpiration and circulation, at an altitude of 15,000 feet.

What are the aerial phenomena that attend a fall of the barometer? How can the weight of the maſs of air ſurrounding the globe, be ſuddenly taken off, over a whole continent? What becomes of its gravity, and the principle of attraction on which it is ſuppoſed to depend? Are they removed, expelled, or ſuſpended?

I ſuſpect the theory which aſſigns to the barometer the province of determining the *gravity* of air, is fundamentally defective; and that inſtead of variations in its *weight*, it indicates only variations in the combinations of its parts, which diverſify its *elaſticity*, and its operation on the barometer, as well as on the human body. When the atmoſphere is full of vapor, the barometer uſually falls, and we feel a depreſſion of ſpirits. It can hardly be true, that the preſſure of the whole atmoſphere is leſs, at ſuch a time, than when the air is clear and the barometer high; for this vapor circulates near the earth and the higher regions of the air are as clear and as ponderous as uſual. If the denſity of the air near the earth ſhould be leſſened, the conſequence muſt be the air from higher regions, which retains its gravity, muſt inſtantly ruſh in to ſupply the defect.

The only way to account for the variations of the barometer, appears to be on the principle before mentioned. The air appears to be leſs elaſtic, when the heat is combined with vapor, and the mercury falls. It ſeems neceſſary to take into view theſe conſiderations in order to ſolve the phenomena. The general preſſure of the atmoſphere or gravity, is probably uniform, and it is the various changes in its elaſtic powers, which occaſion the vibrations in the barometer.

Every dairy woman knows that thunder and lightning will almoſt inſtantly coagulate milk ; that is, when electricity is united with vapor, and paſſes, in a viſible form, from cloud to cloud, or between the clouds and the earth, *milk turns*, or coagulates—ſo it does, during a rainy day, in ſummer, without thunder, with the thermometer at 64 deg. as I know by obſervation. This condition of the atmoſphere, may be called its *decompoſed* ſtate. The barometer falls, vapor becomes viſible, the functions of the body are languid, milk coagulates, objects contract mould, in ſhort the atmoſphere is unelaſtic, and ill-fitted to maintain vigor in animal or vegetable bodies.

Thus alſo the fermentation of beer is checked and deſtroyed by thunder, and no human art has been found to reſtore it. By what proceſs of electricity is this ſudden change effected ?

I have remarked in the preceding pages, that a peſtilential atmoſphere is not corrected or moved by the force of wind—no tempeſt expelling an epidemic fever from a city, unleſs at the cloſe of the ſeaſon, and accompanied with heavy rains. How can we ſolve this difficulty, but upon the hypotheſis of an electrical atmoſphere which is ſtationary ?

Dr. Franklin proved that " an electrified cork ball at the end of a ſilk thread, whirled never ſo rapidly through the air, for a length of time, loſt none of its electricity. He found alſo by an experiment that an electrical atmoſphere raiſed round a thick wire, inſerted in a phial of air, drives out none of the air ; nor on withdrawing that atmoſphere, would any air ruſh in." On Electricity, Lond. ed. 97. It is alſo proved that a moſt violent blaſt of wind, thrown acroſs a ſtream of electrical matter, has not the leaſt effect upon it.

Theſe experiments prove that air furniſhes no ſenſible reſiſtance to the motion of electricity, and that it exiſts in air without expanding or compreſſing it. In ſhort it proves that electricity acts entirely by its own laws, and is not controlled by the agitations of the air.

Will not theſe obſervations throw light on the fact of a ſtationary atmoſphere in caſes of peſtilential epidemics? Is not electricity the baſis of the common atmoſphere, and immoveable by wind? And does not a peſtilential air conſiſt partly in ſome combinations of this element, with other aerial ſubſtances, which are not moved by wind? This is ſuggeſted merely for conſideration; for it appears to me improbable. Froſt deſtroys the peſtilential condition of the atmoſphere, and this is ſuppoſed to act upon the deleterious ſubſtances ariſing from the earth, or human body. Beſides, a peſtilential atmoſphere riſes but a few feet above the earth, which indicates that its pernicious qualities are denſe and gravitating ſubſtances.

Indeed two cauſes ſeem to concur in the origin of peſtilential fevers—an electrical condition of the atmoſphere which renders the nervous ſyſtem extremely irritable, and the body of courſe prone to fever; and a collection of morbid matters ariſing from living* and dead animals, and putrefying vegetables. Wind may remove the latter cauſe, if acceſſible, which however is never the caſe in large cities; but cannot affect the influence of the former. Froſt has acceſs to all morbid cauſes, and renders them inert. It alſo reduces the ſtimulus acting on the human body, and renders it leſs irritable. But the electrical ſtimulus remains. Hence altho the progreſs of the fever is arreſted by cold, the type of it is viſible in the diſeaſes of the winter. The irritability of the ſyſtem, from electrical cauſes, ſtill remains; and gives to the fevers of winter the peculiar ſymptoms of peſtilential or typhus pleuriſy, and peripneumony.

A remarkable property of electricity is to give polarity to the needle of a compaſs. A violent ſtroke of electricity, deſtroyed the virtue of the loadſtone, and reverſed the ends of the needle of the compaſs on board of Capt. Waddell's ſhip in 1751; and a ſuitable diſcharge of that element will give polarity, like the magnet. Hence it is concluded that magnetiſm depends on electricity, but in what manner, ſeems to be myſterious.

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* I mention the morbid matters from *living* bodies, among the cauſes of peſtilence. I am perſuaded that perſpiration in cities furniſhes more poiſon than ſtreets and alleys. It fills all cloſe rooms, eſpecially bed rooms; in cloſe-built ſtreets, it infects the very atmoſphere; and a more virulent poiſon does not exiſt, than perſpirable matter in a condenſed and fermenting ſtate. This can only be deſtroyed by a liberal uſe of water.

It is well known that the needle is ſubject to variations, which are different in different parts of the earth ; and in ſome degree, periodical. It has alſo a ſmall diurnal variation ; receding from the eaſt *or influence of the ſun* from 8 o'clock in the morning to 2 in the afternoon ; and from the weſt, or the ſame influence, from 2 o'clock to 9 P. M. ; and during the night, remaining ſtationary. Is not this owing to the repulſion of light and heat ? If ſo, is there not an analogy between this diurnal variation, and the phenomenon of polarity ? If light and heat, falling on one ſide of the needle, repel it in a ſmall degree ; is it not rational to conclude that the equatorial heat, ſhould repel the magnetic point, and direct it to the north ? That is, the needle points towards that portion of the atmoſphere which is moſt perfectly electric.

It may be objected that the needle does not always direct itſelf to the ſame point. True ; but there is ſome periodical revolution in the electricity of the terreſtrial regions ; as the appearance and diſappearance of the lumen boreale, at certain periods, warrants this ſuggeſtion. It ſeems to be admitted that there is a current of electricity from the equatorial regions towards the polar regions, within the earth, and in the upper parts of the atmoſphere, a current of the ſame element from the poles towards the equator. This idea is derived in part from the lumen boreale, and receives countenance from the fact, that a bar of iron, ſtanding directed towards the pole will acquire polarity or magnetic properties ; but directed towards other points in the heavens, no ſuch effect is produced ; indicating a ſtream of electricity paſſing through the bar, from the center of the earth towards the pole, but not in any other direction.

Should this idea be well founded, and ſhould it be admitted that the lumen boreale is a current of electricity from the north to the ſouth, will not the periodical appearance and diſppearance of this light, indicate a revolution in that current about the axis of the earth, or perhaps an axis of its own ? If ſo, on what laws does it depend, and how will it agree with the variations of the compaſs ?

It will be ſaid, that the variations are different in different places, and not uniform in the ſame place. True ; but the general courſe of variations in the ſame place is tolerably uniform.

With reſpect to different degrees of variations in various places, I have one obſervation that is probably new. It is very probable, if not evident, that the *diſtributions* or *forces* of electricity are different in different quarters of the globe. I ſay *diſtributions* or *forces ;* for a difference in the ſtate of exiſtence or modes of acting, will as well account for the phenomena, as difference in quantity. My reaſons for this opinion are, that the barometer has different altitudes, in different places, at the ſame time. The mean altitude for a month or a year, in places of the ſame elevation, is very various. Hence we conclude that the weight of the atmoſphere cannot be the cauſe of theſe variations, for this on a level of the ocean, muſt, on hydroſtatic principles, be every where the ſame. Yet the actual differences amount to one half or two thirds of an inch.

See Phil. Tranſ. No 435. Bad. Mem. Vol. 10. 81.

It is eaſy to account for this difference of preſſure on the principle of different combinations of the electric principle with vapor or other local matter in the atmoſphere, which may vary the *force* or elaſticity of the air ; but I do not ſee how the *weight* of a fluid alone, whoſe preſſure muſt be equal, if of equal height and denſity, can account for theſe differences. It is utterly repugnant to all known principles of the equable preſſure of a gravitating fluid, to ſuppoſe a mere change in the form or compoſition of that fluid, ſhould alter the abſolute weight. Water admits none of theſe varieties, being always of equal denſity and gravity at equal altitudes.

On the ſame principle of a difference of preſſure or elaſticity in air and water, without a change of weight, perhaps we may account for the very different elevations of the tide in different places, and in ſome inſtances, in the ſame latitude. It is rational to conclude that the electricity is various in its combinations or quantity, in different places, according to the heat of the climate, the neighborhood of land and high mountains, or perhaps to the ſeats of volcanoes ? The fact that tides do not riſe as high, on the main ocean, as near land, ſeems to countenance this idea.

It ſeems to indicate that the medium by which the moon influences the water, has different powers near the land and at a great diſtance.

Another fact that ſeems to favor the hypotheſis that electricity is the inſtrument of tides, is, the great irregularity of tides. In many inſtances there have been preternatural ebbings and flowings of the tide—ſometimes the river Thames, for inſtance, has been left almoſt dry, for many hours, when there has been neither wind nor earthquake to account for the phenomenon.*

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* A receſs of this kind is mentioned in 1114, when the Thames for the whole day, on the 15th of October, was ſo low, that children waded over between the Tower and London bridge. In 1247 there was a ceſſation of the flowing of the tides for three months, before a ſevere earthquake. See Short vol. 2. 145. I ſhould not be inclined to credit theſe relations if modern obſervations did not ſerve to confirm them. On the 11th of March 1785 and 25th of January 1787, the Tiviat, a large river in the ſouth of Scotland, receded and left its channel dry, in the former inſtance, *two hours*, and in the latter, *four*. No convulſion of the earth was known in that neighborhood, nor within two or three weeks of the firſt inſtance. An earthquake happened on the 26th of January, the day *after* the ſecond inſtance, but could not be the cauſe. A ſimilar receſs happened on the day of the earthquake, in the river Clyde. On the 12th of September 1784, in perfectly calm weather, the water in the Lock Tay in Scotland ſuddenly ebbed 300 feet and left the channel dry, then flowed again, and thus alternately roſe and fell for two hours. The ſame phenomenon, in a leſs degree, occurred in ſeveral ſucceeding days. Sinclair, vol 6. 624.

The facts related of the ſea and rivers in Holland on the day, but not at the hour, of the earthquake, at Liſbon, in 1755, when ſhips ſnapped their cables, and water daſhed over the ſides of veſſels, without the leaſt ſenſible motion of the earth, are ſtrong proofs of the ſame inſenſible but immenſely powerful action of the electricity of the globe. The ſwelling of the ocean in the time of earthquakes is not ſo much owing to the riſing of the earth beneath, as to the force of electricity. The intumeſcence ſometimes begins *before* the ſhock, as it does *before* hurricanes in the Weſt-Indies.

In Scotland, during the great earthquakes in Calabria, in 1782, the water in the locks was agitated without any motion of the earth, and the mercury in the barometer fell within the tenth of an inch of the bottom of the ſcale. On the 12th of February 1787, the barometer at Edinburgh fell nearly to the ſame point.

Theſe phenomena can be reſolved into no cauſe but ſome operation of electricity, and they add much weight to my ſuſpicions, that tides are governed by ſome laws of electricity, which are influenced by the phaſes of the moon.

The great fall of the barometer in Scotland is a ſtrong evidence that the ſame energetic principle governs that inſtrument. It is abſurd to ſuppoſe the atmoſphere could have loſt ſuch a portion of its weight. Indeed it is far from being impoſſible that the riſe and fall of the barometer may be occaſioned by the force of electricity acting on the qickſilver itſelf.

If any perſon ſhould heſitate to believe that a mere change in the

Theſe irregularities have invariably happened in years, which have been remarkable for electrical phenomena. To this point I have paid particular attention. They are not always attendant on earthquakes, or volcanic eruptions ; but they occur in the ſame year, or near the ſame period ; evidencing that when thoſe viſible diſcharges take place, inſenſible diſcharges take place in remote countries, and on the oppoſite ſide of the globe.

Should it be admitted that electricity may be unequally diſtributed or operate with different forces, in various places, according to its combinations with aerial ſubſtances, at different times, we may find ſome probable cauſes of the great diverſity of diſeaſes in the ſame year, as well as of the different heights of the barometer. The ſtimulus applied to the human body, may be different in various places, according to the predominant operation of one or more of the following cauſes.

I. Soil, which may affect the air in various ways.

II. Situation in regard to elevation, to water, hills, mountains, minerals, freſh air.

III. The population of places, and all the conſequent evils of noxious exhalations.

IV. The cultivation of a country, which has a moſt ſalutary effect on the atmoſphere.

It is very certain that the condition of the atmoſphere is very different, in places which appear to be equally favorable to

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combination of electricity and aerial ſubſtances, may vary the ſpring or elaſticity, without the leaſt alteration of their weight, let him attend to the different powers of wine, cyder or beer, before and after fermentation begins. It is not preſumable that the liquor has more weight in a ſtate of fermentation, than when quieſcent, before that proceſs begins ; yet the force with which it acts upon the caſk containing it, is increaſed perhaps a hundred fold. I ſuſpect that the changes in the atmoſphere which affect the barometer and the human body are analogous to what we obſerve in liquors—mere alterations in the combinations of the parts, producing various elaſtic powers, without any change in the general gravity of the atmoſphere. Hence it is eaſy to conceive that the elaſtic power of the atmoſphere may be diverſified by ſubſtances exhaled from the earth, in different ſituations ; this may occaſion ſmall variations of the barometer in two diſtant places, having the ſame altitude, and be one cauſe of differences in the ſalubrity of the air.

This idea is ſtill better illuſtrated by the different properties of gunpowder in the kernel and in a ſtate of exploſion. In the former ſtate, an immenſe elaſtic power is confined to a compaſs inconceivably ſmall—by adding to it a ſpark of fire, this elaſtic power is ſet looſe with tremendous effects.

health. Children and valetudinarians are very ſenſible of theſe differences. It is hardly poſſible to remove an indiſpoſed perſon a diſtance of five miles, without a ſenſible effect on his health; he is better or worſe in his new atmoſphere. Under the combined operation of ſuch various cauſes, we are not to be ſurpriſed at the irregularity in the appearance of autumnal and epidemic diſeaſes.

Much labor has been employed to inveſtigate the cauſe of ſenſation and perception. The moſt able philoſophers maintain the neceſſity of a medium through which we receive impreſſions of diſtant objects. The rays of light are ſuppoſed to be the medium of viſion, and an elaſtic air, the medium of ſounds. But by what means impreſſions on one part of the body are almoſt inſtantaneouſly communicated to the other parts, may be a queſtion of difficult ſolution.

It appears to me probable that the medium by which impreſſions are conveyed from one object to another, is that moſt elaſtic fluid, the principle of fire or electricity, which pervades every object and is diffuſed through creation. A motion given to this fluid in the brain is inſtantly conveyed, by its elaſtic property, to the remoteſt fibre, and vice verſa. The ſame fluid, diffuſed through the ſolar ſyſtem, and all creation, may and probably is the medium by which diſtant orbs make impreſſions on each other.

It is abſurd to ſuppoſe that the bodies that compoſe the ſolar ſyſtem, or any other ſyſtem of worlds, can be ſuſpended in an immenſe void, and revolve about a common center, at diſtances of many millions of miles, without ſome medium of connection; ſome tie to bind them together. It is abſurd to ſuppoſe that an influence can be exerted between them, unleſs thro the medium of a ſubſtance. This ſubſtance is doubtleſs that ſubtle, elaſtic fluid which conſtitutes the baſis of fire, heat, light, or electricity. This fluid, receiving an impreſſion from one globe, in any part of ſpace, may impart it to another, in a few moments, by means of its elaſtic powers. This theory accords with the known properties of electricity; and affords a ſublime idea of the magnificent ſtructure of the univerſe.

The heat of a fever may proceed from the ſame fluid; and hence the value of water, as a conductor, to carry off the heat of a fever. In all fevers, this is the indication of cure given by nature. Hence the obvious and prime utility of perſpiration, in the cure of peſtilential fevers, which ſeize the very ſeat of life, the eſſential organs of the nervous ſyſtem—parts of the body which medicins taken into the ſtomach do not eaſily reach. Perſpiration and ſalivation, by throwing out moiſt and fluid ſubſtances, thus conducting the heat or electric principle to the ſurface, ſeem to be the moſt certain remedies.

This elaſtic principle, if any thing, is the ſubſtance which has given riſe to the doctrins of galvaniſm, animal magnetiſm—and Perkiniſm. But if thoſe doctrins have any juſt foundation, the nature and modifications of the principle are ſo little underſtood, that all attempts to reduce the doctrins to certainty or ſyſtem have hitherto been defeated. Primary cauſes elude all the reſearches of man, and compel him to acknowlege his ignorance.

On the popular modes of guarding againſt infection.

MANKIND have, in all ages, reſorted to a variety of expedients to guard themſelves from peſtilential diſtempers, and to check them when exiſting. The uſe of aromatics as a *peſtifuge*, is as old as the journey of the Iſraelites from Egypt; for when the plague had broke out among them, Aaron took his cenſer, put on *incenſe*, and ſtanding between the dead and living, the plague was ſtayed.

Numb. xvi. 47.

Herodian relates that in time of peſtilence, the Romans ſtuffed their noſtrils with aromatics, but without ſucceſs.

Mignot relates that the Turks, at this day, make great uſe of aromatics, to guard themſelves from the plague.

Hiſt. Turk. Emp. vol. 2.

Diemerbroeck chewed tobacco as a preſervative, and alleges many inſtances of its good effects. It is not improbable that this article, by promoting diſcharges of the ſaliva, may prevent the noxious matter from entering the ſyſtem by the fauces, which are principal agents in abſorbing the poiſon. Any other herb that will promote ſpitting, would probably be equally ſalutary. Waſhing the mouth frequently with freſh water is very uſeful in the ſame way; and nurſes ſhould never inhale the effluvia of the ſick, without immediately waſhing the mouth.

In our country, many ſimilar expedients are employed to ward off infection. Camphor is worn in little bags around the neck, or frequently applied to the noſe.

It does not appear that aromatics and pungent ſalts have much effect in reſiſting the attacks of peſtilence. There is probably no attraction between the particles of ſuch ſubſtances and the poiſon of the plague. Stimulants are uſeful, in ſome caſes, when applied to the whole body; but applied to the noſe, their effect is local, and wholly inadequate to the purpoſe. A ſpoonful of freſh water, taken frequently into the mouth, and diſcharged, is better than a pound of camphor; for water mingles the infectious particles with its maſs, and renders it harmleſs or carries it off.

It is poſſible however that, in ſome caſes, an atmoſphere impregnated with the ſtimulating effluvia of ſpiceries may preſerve the body from the attacks of this diſeaſe. An inſtance is related in Acta Eruditorum of the year 1721, publiſhed at Leipſic, that perſons living near ſtorehouſes of ſpices eſcaped the plague. We ſhould however be cautious of drawing concluſions from a ſingle fact. The effect may have proceeded from an unſuſpected cauſe.

Skenkius, from Alex. Benedictus, informs, that it is a cuſtom among the Tartars in the Crimea, to kill their dogs in time of peſtilence and ſuffer them to putrefy on the earth; alleging that the fetor arreſts the plague by changing the air. Page 773. This is certainly a moſt ſingular remedy, and the fact requires good authority and explanation to induce belief. It however correſponds with ſome inſtances, in which peſtilence has been leaſt ſevere in filthy places.

The burning of powder is held to be uſeful in checking the plague, by generating reſpirable air. Lernnius, lib. 2. The blowing up of a magazine has been ſaid to put a ſtop to peſtilence.

During the civil wars in England, which ended in the death of Charles I. Fuller relates that the plague in Litchfield was arreſted by the firing of cannon, at the ſiege of that town. The pious author ſays that many aſcribed this to the *purging of the air by the bullets*, but divines aſcribed it to God's good providence.

It is related in Van Swieten that the fermentation of wines on the Moſelle, in time of vintage, had a moſt ſenſible effect in checking the plague.

It has been cuſtomary to burn reſinous ſubſtances in the ſtreets to ſtop the progreſs of peſtilence, but without any ſenſible effect. It was attempted in Philadelphia in 1793 and in New-York in 1795, but the ill ſucceſs has prevented a repetition of the attempt.

Authors relate that the ancient phyſicians put a ſtop to the plague, by enkindling large fires in the ſtreets. I conſider the fact as doubtful, for it is not agreed among writers, whether this was done by Hippocrates, or another man.

It was however on the ſtrength of the ſtory, that great fires were kindled in London in 1665; but the deaths were more numerous on that night, than they had been before. If fire can be of any uſe in the plague, it muſt be by creating motion in a ſtagnant air, or by drying a moiſt one. The latter effect is that which Galen ſuppoſed to have reſulted from the fires uſed by the ancients; and there may be ſituations and times, when a fire in infected houſes may be applied to good purpoſe, by removing damp ſtagnated air. But it is queſtionable whether the atmoſphere of a city can be ſenſibly and beneficially changed by public fires; and the experiment is very hazardous, for if the fire ſhould be communicated to the buildings, it would not only conſume property, but double the rage of peſtilence. Thus the plague in Conſtantinople in 1539 was greatly inflamed by a fire which conſumed a large part of the city. Fatigue and diſtreſs, added to the previous cauſes, multiplied the new caſes, and one third of the inhabitants periſhed.

Mignot's Hiſt. Turk. Emp. vol. 2.

Every thing which collects, fatigues and alarms people, at ſuch times, is very prejudicial; as the fire in Philadelphia, in 1793; in Providence, in 1797, and the launching of the frigate in Baltimore, in the epidemic of the latter year.

The only effectual ſafety is in flight. When a few caſes of the plague firſt appear, they ſhould be removed, or other precautions taken to prevent any ill effects from infection. They *may* be ſporadic caſes, and ſuch precautions *may* ſave a city from the further progreſs of the diſtemper, among viſitors and attendants. But if theſe precautions prove fruitleſs, as they uſually will, and as they *always* will, when the diſeaſe is the effect of an atmoſpheric principle, which is the fact, nineteen times in twenty, the only certain means of ſecurity, are in quitting the city. The practice of *ſhutting up*, which is cuſtomary in the eaſt, if the people can live in high rooms, may ſave life, but it is very inconvenient, and leſs ſafe than an abandonment of the infected town.

On Veneſection.

THE extenſive mortality occaſioned by the plague, the rapidity of the diſeaſe, and the virulence of its poiſon, which often defies all medical aid, have called forth all the exertions of talents and knowlege, to invent ſome mode of defeating its ravages.

It is agreed on all hands, that perſpiration, if induced on the firſt ſeizure of the patient, is the moſt effectual preſcription. Hence the univerſal uſe of alexipharmics in peſtilence.

But it often happens, that no application whatever will excite perſpiration, and eſpecially, in the later ſtages of the diſeaſe.

No part of the practice of medicin has excited ſuch warm controverſies, as veneſection. It is foreign from my plan to diſcuſs this queſtion; my remarks are intended rather to explain the cauſe of this diverſity of opinions, from my obſervations on hiſtorical facts.

Moſt of the medical writers who were perſonally acquainted with the true plague, in former ages, when it frequently overſpread Europe, have decided againſt bleeding.

In the plague which ravaged all France in 1565, Charles IX. then king, demanded of all the phyſicians to give information of the beſt mode of treatment, and they unanimouſly decided againſt the practice of bleeding liberally.

Skenkius, p. 770.

Ambroſius Paræus, in the ſame plague, made extenſive enquiry, as to the ſucceſs of bleeding and purging, the anſwer of his medical friends was, that in all caſes, theſe evacuations, if powerful, were fatal.

Sennertus, p. 356.

Foreſtus, obſerved, in the plague of 1557, at Delph, that thoſe all died, who were bled after twelve hours from the invaſion of the diſeaſe. Palmerius has teſtified to the ſame effect, and ſo has J. Ant. Sarracenus, in deſcribing a plague in Geneva.

Fallopius remarked in the plague which raged from 1524 to 1530, that all died who were bled. This was obſerved alſo by H. Florentus, a phyſician of Leyden—by Simonius, in the plague of 1602—Hildanus, in the plague at Lauſanne, and a multitude of others. See them collected in Diemerbroeck, de peſte, 130. and ſequel, who found in the plague at Nimeguen " veneſectionem damnoſiſſimam fuiſſe"—bleeding was extremely injurious.

On the other hand, we have in the ſame author a long liſt of names of eminent phyſicians, who warmly advocate veneſection. To this liſt may be added the name of the celebrated Sydenham.

The ſource of this difference of opinion is doubtleſs the difference of the ſymptoms in the diſeaſe under different conſtitutions of air, in different places, and in different habits. The great difference in the ſame diſeaſe, under different epidemic conſtitutions, was moſt diſtinctly obſerved by Sydenham ; and this variety ſeems to conſtitute no ſmall nor eaſy part of the phyſician's inveſtigation.

Sydenham obſerved what is undoubtedly true, that the ſame diſeaſe is characterized with different ſymptoms, under different conditions of the air ; and often the ſame apparent ſtate of air produces very different diſeaſes. It is very evident, that the *viſible* qualities of the ſeaſons are not the *only* circumſtances that modify diſeaſes. The learned Boyle remarks the great diverſity in plagues, requiring remedies altogether different.

Vol. 5. p. 60.

Hence at one time, the plague, in a few hours after invaſion, induces a ſtate of debility, in which bleeding will, in almoſt every caſe, accelerate death. At other times, the diſeaſe may maintain, for two or three days, a highly inflammatory diatheſis, in which a timely, and judicious uſe of the lancet may prevent a fatal termination.

I am perſuaded that hiſtory will juſtify theſe remarks, and make practitioners very cautious of preſcribing for the name of a diſeaſe. This caution is more eſpecially neceſſary on the firſt appearance of an epidemic, before the ruling type of the diſeaſe is fully manifeſted. The doctrins of Sydenham, in regard to the controlling influence of different conſtitutions of air, ſeem not to have been ſtudied and purſued, with the diligence due to their importance. They are the baſis of an intereſting branch of philoſophy as well as medicin ; being grounded on thoſe varieties incident to the ſame object, which characterize all the works of creation—varieties which conſtitute the revolutions in the *ſame* diſeaſe, analogous to thoſe already deſcribed in a *ſeries* of epidemics and in many other phenomena of the world.

On Vapor or Mephitic Air, extricated from the earth by means of diſcharges of the electrical fluid.

I HAVE ſuggeſted in the preceding pages, that epidemic diſeaſes may be ſometimes occaſioned by a vapor extricated from the earth. That ſuch has been the fact in caſes of earthquakes, has been proved by ſeveral examples ; that a deleterious vapor may be expelled from the earth and produce diſeaſes, without a concuſſion, appears from the caſe at Rouen in 1753, and the ſickneſs and death of fiſh are ſtrong evidences of the truth of the principle. Other conſiderations lead to the ſame reſult.

In the account which Sir W. Hamilton has given of the eruption of Veſuvius in 1794, Univ. Mag. Oct. 1795, it is obſerved, that “ after every eruption of that volcano we read of damage done by mephitic air, which coming from under the ancient lava, inſinuates itſelf into low places, as cellars and wells near the foot of the mountain.” Several inſtances happened after the eruption of 1767, of perſons going into cellars and being ſtruck down with this vapor, who would have died, without aſſiſtance. This vapor on an open plain ſubſides near the earth, being heavier than common air; but it fills cellars, wells and hollow places, ſo as to endanger life, and actually proves fatal to birds, beaſts, and vegetables; ſometimes to men. This vapor or fixed air is generated by the action of vitriolic acid on calcareous earth; and by other means in the immenſe laboratory of Nature's works.

The facts here ſtated and which are well known to every chymiſt, will perhaps account for the *damps* in wells, as this fixed air is called in popular language. It is a common idea that air will become impregnated with this vapor, by mere ſtagnation in a well. This is probably a miſtake. Nor is it probable that any ſubſtances in the well generate this air. It cannot proceed from water, nor from the earth, or ſtones, or rocks which compoſe the ſides of the well, unleſs the earth is different from common earth. It is probable therefore that this mephitic vapor is expelled from the earth by force of internal heat or electrical fire; and that this happens not uniformly, or at any certain times. I ſuſpect that the diſcharge of it happens at particular times in various parts of the earth, from cauſes not yet explained; and that it occaſions epidemic diſeaſes among men, beaſts and fiſhes. To aid us in an enquiry of this kind, it would be neceſſary to examin a great number of facts, and diſcover whether this mephitic vapor is ever found in wells, except when epidemic diſeaſes of ſome ſort or other prevail among animals.

On the 30th of Auguſt 1795, juſt after the peſtilential fever appeared in New-York, two men fell victims to this vapor, in a well belonging to a brewery in Pine-ſtreet, within a few yards of the houſe where I then reſided. The well had been dug but a few months, and was not uſed, but covered over with boards. It was about 25 or 30 feet deep, contained a few feet of water, and was ſo full of mephitic vapor, that a candle was extinguiſhed within eight feet of the ſurface of the earth, as I found by experiment. This was during the ſickneſs, and a queſtion ariſes whether the two things were connected in cauſe. Had not a ſimilar vapor been ſilently thrown from the bowels of the earth, over all the coaſt and region from New-Jerſey to Connecticut, for ſome months previous? And may not the ſickneſs of the oyſters and ſhad on that coaſt, from 1794 to 1796, as well as the deſtructive epidemic angina, fevers and dyſentery, be aſcribed to that cauſe? I offer this hint to excite enquiry. Gov. Ellis, in a paper on the ſubject of hurricanes, Muſeum, vol. 9. 215, mentions, among the precurſors of thoſe tempeſts, thick vapors in the air "ſenſibly mephitic." If this vapor is the cauſe of diſeaſes, it will account for the greater prevalence of them in low ſituations.

There is reaſon to ſuſpect that this mephitic air is expelled from the earth, in conſiderable quantities, at particular times, but incorporating itſelf with the common air, it does not often prove fatal to men, altho it may leſſen the vital powers of the atmoſphere, and aid in the production of diſeaſes.

In 1729, on the 19th of July, a Mr. Adams of Boſton and his ſervant periſhed by this air in a well. Let it be obſerved that in this year, the influenza ſpread over Europe. Whether it was in America or not, I cannot learn; but the meaſles was epidemic in Boſton, in that year; and other parts of America were ſickly.

But what among other things inclines me to the opinion that this ſpecies of air is not generated gradually in wells, but is expelled from the earth ſuddenly, is a fact related in the ſame paper with the foregoing, Baddam's Mem. vol. 9. 4. Phil. Tranſ. 411; that on the 9th of May preceding this accident, two men at work in a well in School-ſtreet, Boſton, were ſuddenly attacked by this ſpecies of vapor, and came near loſing their lives. The well had recently been dug and enlarged, the workmen experiencing no inconvenience; and that the vapor did not proceed from opening a new chaſm, or breaking a new ſtratum of earth or minerals, is certain; for the men were not then digging, but ſtoning the ſides of the well.

In Philoſophical Tranſactions, No. 119, it is ſaid that damps are generally obſerved to come about the end of May, and to continue during the heat of ſummer. At that ſeaſon alſo they are moſt violent in mines infeſted with them, during the whole year. But by a ſubſequent paragraph, it appears that the writer in that remark made no diſtinction between fixed air and inflammable.

If it is true that this vapor is expelled from the earth in ſpring and ſummer only or principally, to what cauſe ſhall we aſcribe that circumſtance ? Not to internal heat certainly, for that at the depth of 20 feet is always the ſame. We may perhaps find a ſolution in the excited atmoſphere of ſummer, which may occaſion diſcharges of electricity.

It might be well for the world, if experiments were made to aſcertain theſe points. If a vapor is at times thrown into the atmoſphere from the internal parts of the earth, and becomes noxious to health, it is of great conſequence to the world to know the fact, as this air ſubſides into the lower grounds, and might often be avoided. A deep covered well and not uſed, might be kept for this purpoſe, and a lighted candle or lamp let down to its bottom once a month. If there had been a diſcharge of mephitic air, it would be found in the well ; but if the air of the well ſhould be found good, we might conclude that the atmoſphere had received no taint from ſubterranean vapor.

This ſubject deſerves inveſtigation. The herbage is at times affected by a dew or clammy ſubſtance, which is viſible, tangible and offenſive to cattle. Inſtances have been related in the preceding hiſtory. The honey-dew is a curious phenomenon, not well underſtood. This is a ſubſtance that reſembles honey or wax, depoſited on the leaves of trees, and attaching itſelf to blades of corn. It is ſweet to the taſte, and the honey-bee is ſeen to feed upon it. To corn it is very prejudicial, by cauſing a blaſt.

I have not been able to aſcertain whether this is a periodical or an accidental phenomenon, nor to find the cauſes of it in the known properties of air or water. Is it the produce of a vapor from the earth ; or of ſome unuſual combination of aerial ſubſtances ?

We live in a fluid, compoſed of various ingredients, each of which has its own properties, and by various combinations, and inceſſant changes, theſe ingredients are daily generating new properties. One day, the ſky is calm and cloudleſs ; the next, the heavens are wrapped in vapor, and the earth deluged with rain. One moment, we are ſhrouded in chaotic darkneſs; the next preſents to us the heavens and earth in a ſheet of livid flame. Inſtantaneous is the tranſition from the ſilence of the grave to peals of thunder that ſhake the earth beneath our feet; and the field that ſmiles with its golden fruits, to day, is to-morrow torn with the raging tempeſt, ſtripped of its beauties, and converted into a barren waſte.

Immerſed in elements productive of theſe ſudden and tremendous effects, how is it poſſible that man ſhould paſs through life without feeling inconveniencies from principles capable of ſuch aſtoniſhing viciſſitudes? Inſtead of wondering at the phenomenon of peſtilence and other epidemic diſeaſes, and hunting, with microſcopic view, for a bundle of clothes in which to find the germ of a malady that deſolates the earth, men would ſhow more wiſdom and more correct underſtanding, if they would collect facts, with care, examin them with candor, and endeavor by this proceſs to arrive at ſome knowlege of the powers and effects of thoſe elements which compoſe all animal bodies, and from whoſe operations are immediately derived all the vital energies. There we may find, altho we may not be able to comprehend, principles of diſeaſe as powerful and as univerſal as the laws of nature.

On the revolution of certain Comets.

SINCE this work has been in the preſs, I have had the curioſity to trace back the revolutions of two or three comets, whoſe periods were calculated by Dr. Halley, to find how far his aſtronomical calculations are verified by the hiſtory of the appearance of comets, in former ages. The following are the reſults.

The comet of 1682 Dr. Halley found to have a period of 75 years. If this calculation is exact, the ſame comet muſt have appeared in the following years. The firſt column contains the years when the comet muſt have appeared, ſuppoſing its period to be exactly 75 years—the ſecond, contains the years when a comet appeared, according to the preceding hiſtory.

A. D.		A. D.	
1757	1757	856	858
1682	1682	781	784
1607	1607	706	
1531	1531	631	632
1456	1456	556	556 or 8
1380	1380	481	480
1306	1305	406	407
1231		331	
1156		256	
1081		181	181
1006	1005	106	
931		31	

I have found no mention of a comet in 1231, 1156, 1081, 931, 781, 706; but the phyſical phenomena at thoſe periods, as ſevere winters, inundations, earthquakes, peſtilence, &c. render it more than probable that a comet was viſible, in thoſe years, or in the next preceding or following. In ſome other periods, a comet is mentioned in the next year, to that which is deſignated in the firſt column; but I take this difference to proceed from the fractions of a year—the period of the comet not being exactly a year.

If theſe calculations and facts may be relied on, this comet muſt have appeared in the year 256, in the midſt of the mortal peſtilence, in the reign of Gallus and Voluſian, and in the year 31 or 32, a little before the crucifixion of our Savior.

The calculations reſpecting the return of the comet of 1661 coincide remarkably with hiſtorical facts. Its period is ſuppoſed to be 129 years. If ſo, then it muſt have appeared in the years named in the firſt of the following columns—the ſecond column contains the years when a comet did actually appear, according to the hiſtory in the firſt volume.

A. D.		A. D.	
1790		500	502
1661	1661	371	
1532	1532	242	
1403	1402	113	
1274	1274	Before Chriſt.	
1145	1145	16	
1016	1017	145	145 or 7
887		274	
758	759	403	
629			

I have no account of a comet in 887; but in page 112 of Vol. I. a ſevere plague and hard winter are mentioned, under that year. The events related in page 77, under the years 242 and 3, are ſuch as lead me to ſuſpect a comet, at that period, which correſponds with the calculations; but I have no account of any. The ſame remarks may be made reſpecting the events of the years 114 to 117, when Antioch was deſtroyed, as related page 70.

Of the events before Chriſt 16, I have no particular account. The three preceding periods of this comet, before Chriſt 145, 274, and 403, correſpond with great peſtilence. See pages 42 and 43—48—56 of Vol. I. And this might have been the ſtar alluded to by Juſtin, in the paſſage quoted in page 43.

But we have an inſuperable difficulty to theſe calculations—this ſtar, if its period is 129 years, ſhould have appeared in 1789 or 90; but no comet was ſeen. One appeared in the autumn of 1788, but I know not whether the elements of its trajectory correſponded with thoſe of the ſtar of 1661. Calculations of this kind are yet too uncertian to be the baſis of a ſyſtem.

It is greatly to be deſired that the revolutions of the comets could be reduced to as much certainty, as thoſe of the planets. Such calculations would enable as to account for many of the violent changes on this globe; and aid us to fix the era of certain great phenomena of antiquity: For no fact is better eſtabliſhed, than that comets have a prodigious influence on the electricity of the earth and its atmoſphere.

The comet of 1680 is ſuppoſed to have a period of 575; and the appearance of a ſplendid ſtar of this kind in 1105 and 531, gives reaſon to believe the calculation juſt. If ſo, it muſt have appeared before Chriſt 44—619—1194—1769 and 2344. The latter year falls within 8 years of the period aſſigned to the deluge. But the uncertainty of ancient chronology leaves room to queſtion all reſults from theſe calculations.

POSTSCRIPT.

IN the courſe of my inveſtigations into the origin of the bilious plague, I have had ſo many opportunities to detect the errors proceeding from *common report*, that I am led to queſtion every fact that does not come directly from the perſons concerned in the tranſaction related. I had ſuch confidence, for inſtance, in the facts publiſhed and believed by the people in New-Haven, reſpecting the origin of the fever of 1794, in that city, from imported ſources, that I had prepared an account of it for the preſs, before I called on the perſons beſt able to give me correct information. On examination, I was ſurpriſed to find moſt of the ſuppoſed facts totally unfounded; and Mr. Gorham and Capt. Truman, the perſons concerned, when informed of the reports which had been circulated on the ſubject, expreſſed their ſurpriſe that people ſhould have propagated ſuch tales, without calling on them for a true ſtate of facts.

It was ſaid and publiſhed that Polly Gorham, the *ſecond* perſon ſeized with the fever, was preſent in Mr. Auſtin's ſtore when the cheſt of clothes was opened. The gentleman who publiſhed this report, has ſince informed me that he had no authority for it, but the ſtory of a child of ſix or ſeven years old. But Capt. Truman who opened the cheſt himſelf informs me, that Polly Gorham was *not* in the ſtore at the time.

It was reported and is ſtill believed, by moſt of the people in the town, that Iſaac Gorham's wife waſhed infected clothes; but Mr. Gorham aſſures me that there is not the leaſt foundation for the ſtory, and he is aſtoniſhed that ſuch a tale could have been circulated. He cannot aſſign any good cauſe for the fever in his family, and is inclined to the opinion that no infection was received from the ſloop.

It is poſſible and probable that ſome perſons who came in the ſloop had been into Gorham's houſe; at leaſt into the ſhop in the front room. And this is the only poſſible way to account for the propagation of infection from that ſloop, even admitting that it contained infected clothing. But even in this caſe, it would ſeem ſtrange that Gorham himſelf ſhould eſcape, and his wife and niece who were uſually in the back room, ſhould contract diſeaſe. But the following facts which have been received from Capt. Truman, ſince the firſt volume was printed, will ſhow the improbability, if not the impoſſibility, of ſuch a communication of infection.

This ſloop, called the Iris, arrived from Martinico at New-York in May. All her men and paſſengers were and had been, during the paſſage, in good health. The ſloop of courſe was permitted to enter as a clean veſſel, and ſhe was hauled up to a wharf, where ſhe lay ten or twelve days wind-bound, before ſhe could proceed to New-Haven. She had no cargo on board, except a few ſalted hides, which were taken out and put on board of a coaſter, commanded by Capt. Miles to be tranſported to New-Haven. This was done without the leaſt injury to any perſon concerned in removing the hides. At this time happened a long ſeries of eaſterly winds and rainy weather, ſucceeding the memorable froſt after the 17th of May 1794. In theſe rains the veſſel was waſhed inceſſantly day after day, and ſhe was viſited by many perſons who had buſineſs on board; and as it happens with all veſſels that lie at a wharf in ſuch a place, hundreds, if not thouſands muſt have been on board, while ſhe lay at New-York. Now it happens that not a ſoul among all that were on board, from the time of her leaving Martinico, till ſhe arrived at New-Haven, was affected with fever. How the ſloop or the hands, after having intercourſe with ſo many perſons, came to reſerve their infection for New-Haven, I ſubmit to be determined by wiſer heads than mine. The facts are here ſtated from the information of the perſons concerned—thoſe which have been before publiſhed, are mingled and confounded with popular rumors which can be traced to no genuin ſources.

Let it be noted that when the two firſt perſons were ſeized, no perſon ſuſpected the diſeaſe to be the yellow fever. Mrs.

Gorham probably died without ever knowing her diſeaſe—at leaſt her phyſician did not ſuſpect it, till ſhe vomited black matter, the evening before her death. Hence it happened that no enquiry into the origin of the fever, took place till ſeveral days afterwards, and not till after the death of Mr. Auſtin and his clerk. This is one reaſon why it became difficult to obtain a true ſtate of facts—a difficulty that was greatly increaſed by the alarm and conſequent perturbation of the public mind.

And after all the queſtion of domeſtic or foreign origin is much better decided by the character and phenomena of the epidemic, than by any human teſtimony relating to things not viſible. The caſe of a bilious fever, attended with black vomit, mentioned in page 306 of Vol. I. occurred in the laſt week in March, near the wharf and in the center of the ground, afterwards the ſeat of the fever. It was leſs malignant than in autumn, but from the deſcription of it given me by the woman's mother and the attending clergyman [the phyſician being dead] I muſt conclude the diſeaſe to have been of the ſame ſpecies, and indicating a diſpoſition in the atmoſphere of the place to give to fever that particular character.* The ſcarlatina was then the current epidemic. In May this declined, and gradually diſappeared, in June and July, as the yellow fever advanced. To a philoſophic mind, theſe facts amount to evidence of domeſtic origin, that far out-weighs the uncertain and contradictory evidence of the importation of a ſubſtance which is neither viſible nor tangible.

With reſpect to the origin of the fever at Hartford, I have this further evidence. The ſloop mentioned in page 347, had never been in the leaſt infected with any diſeaſe whatever, before ſhe arrived at Hartford. Her former Captain died in May of a lingering complaint. He went to New-York after he was unwell and growing worſe, he returned and died at home. Captain Tucker then took the command, went to New-York and took on board a cargo of ſalt. From thence he ſailed to New-Haven, where he lay five or ſix days, at the wharf, endeavoring to ſell the ſalt. While there, people indiſcriminately were on board, and among them ſeveral gentlemen of my acquaintance who give me this information. This was about the middle of July, and as it was juſt after the Neptune arrived from China, the wharf was unuſually crouded with people, who were paſſing and repaſſing between the wharf and that ſhip. Here then the ſloop did no miſchief. She went to Hartford and diſcharged her ſalt. I have unequivocal evidence that not a perſon concerned in unloading her, was affected with fever, and that ſeveral of the perſons firſt ſeized in Hartford, had not been near her. After ſhe left Hartford the captain and mate were ſeized, and the former died [not both as ſtated in page 347.]

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* The phyſician, Dr. Hubbard, after the fever appeared in ſummer, mentioned to the Rev. Mr. Hubbard, that it was of the ſame ſpecies with that which occurred in March. This caſe was nine or ten weeks before the arrival of the Iris.

Another veſſel, I find, has by ſome been ſuſpected of introducing the fever into Hartford. This alſo was a coaſting veſſel, which took in a paſſenger at New-York, who ſickened, after he came on board, and the maſter landed him at New-Haven. If I am rightly informed, this veſſel did not arrive at Hartford, until after the firſt caſes of fever occurred ; but of this I am not certain. Certain it is, that no perſon on board, except the paſſenger landed at New-Haven, was ever ill, and therefore the caſe deſerves no conſideration.

It ought further to be ſtated that two or three weeks before the alarm at Hartford, and before the arrival of thoſe veſſels, a caſe of fever occured of the malignant kind, and in all eſſential points, with the character of the yellow fever. I have lately learnt that a ſimilar fact occurred in Boſton in 1798. Theſe caſes are not uſually numbered with thoſe of yellow fever—but the truth is, and ſuch will it appear to be, when ſcience, philoſophy and candor ſhall triumph over prejudice and popular tales, that theſe milder caſes of fever, bearing the character in a degree, of the ſubſequent epidemic, are the precurſors of the diſeaſe to follow—they are the effect of the atmoſpheric principle on particular ſuſceptible conſtitutions, before the proper ſeaſon for the full force of the principle to operate—they are irreſiſtible evidence that the diſeaſes which they precede, are uſually, if not always, generated in the place where they exiſt.

SINCE the firſt volume was printed, I have obtained from attending phyſicians, an account of the fever at Middle-Haddam, in the town of Chatham, on Connecticut river in 1796. [This is mentioned in page 331 to have been in 1797, but it was in 1796.]

This fever was traced in every inſtance to a veſſel from a port in Hiſpaniola, which was highly infected. No perſon was affected, without direct intercourſe with the veſſel, the clothing or the ſick. About 30 perſons were affected, eight of whom died. When carried to a diſtance, the fever did not ſpread.

That this was a diſeaſe contracted from imported infection is evident from this circumſtance—that in every caſe it could be traced to intercourſe with the ſick or infected articles—it was not taken by paſſing along the ſtreet nor from houſe to houſe. Another fact is equally demonſtrative of this origin ; which is, that it commenced late in September and had no precurſors. When it ariſes from the atmoſphere of the place, it always begins as early as Auguſt or earlier—and this is probably true of every autumnal complaint in our latitude.

The fever in that place therefore was what I call a *diſeaſe of mere infection*, in contradiſtinction from yellow fever originating in the country, which begins uniformly in the hot months, is taken without intercourſe with the ſick or with infected articles, has its precurſors and abſorbs all other diſeaſes or gives them all its predominant type. The diſtinction is ſo obvious that it is not eaſy to miſtake it.

Of the diſeaſes from imported ſources, this is one—two or three other inſtances in the United States have been mentioned. But moſt of the inſtances of this fever in America, ſince 1790, have had the unequivocal characters of epidemics—ſuch characters as never attend, and as cannot poſſibly attend, diſeaſes of mere infection.

IN the ſummer paſt, the wild pigeons in the weſtern parts of New-York ſtate and in Pennſylvania, have been affected with a diſeaſe of which many have died. It is underſtood that the head or neck was ſwelled; but I have no correct account of the diſtemper.

FROM the report of a maſter of a veſſel, it appears that fiſh of various kinds periſhed in September or October laſt, on the Carolina coaſt from Cape Look-out to Cape Fear, a diſtance of 70 miles. Some were ſeen dead and others dying, as far as the eye could reach. The yellow fever has alſo prevailed in ſome parts of both Carolinas. Does not the death of fiſh afford reaſon to believe that the electrical fluid or mephitic air, is occaſionally diſcharged from the earth in unuſual abundance? And may not local diſeaſes be aſcribed to that cauſe?

IN addition to what I have ſaid in the 16th ſection, relative to prediſpoſition to a particular diſeaſe, I would obſerve, that we ought to make a diſtinction between a *natural aptitude to a diſeaſe*, and an *adventitious liability* to it, from artificial cauſes. The latter is what uſually paſſes under the name of *prediſpoſition*: And this may lead to error. When perſons ſay, a man will not take a fever by infection unleſs he is prediſpoſed, they uſually mean that he has, by accidental cauſes, *prepared* his body to be affected. Hence we continually hear the doctrin that infection will not operate in a healthy atmoſphere; but in order to give it force and effect, the atmoſphere muſt be *prepared*; that is, muſt ſuffer a change favorable to a diſeaſe, but not ſufficient to produce it.

I apprehend this doctrin is erroneous. The fact, as a general one, is the reverſe; and the longer a body remains in health in an infected atmoſphere, the leſs liable is it to the diſeaſe. So true is this, that priſoners in jails ſuffer no injury from the air, which will deſtroy the lives of men who enter it, from freſh air. This fact is well known. It is equally true, in our cities, during peſtilence, that perſons from freſh air, are much more liable to be ſeized, on entering the infected atmoſphere, than thoſe who have lived in it. Hence in every caſe of mere infection, perſons are *moſt expoſed* to it, who are *leaſt prepared* or *prediſpoſed* by breathing an infected air.

But not ſuch is the fact with regard to the influence of atmoſpheric cauſes on particular bodies. In this caſe, the cauſe ſingles out and ſeizes the perſons, who have a particular aptitude or habit of body, in a manner altogether unaccountable. Sometimes this power is evidently in operation a long time, before it produces diſeaſe.

Perhaps this natural aptitude of a body to receive or reſiſt diſeaſe, may be illuſtrated by the following fact, which is under every man's obſervation. Let two apples or pears, be taken from a tree at the ſame time—let them be apparently alike in ſoundneſs and in every particular on which their preſervation may be ſuppoſed to depend. Lay them by the ſide of each other—equally expoſed to heat and moiſture. In this caſe, one may and often will periſh many weeks before the other. This aptitude to periſh is natural, and doubtleſs conſiſts in the interior organization of the fruit ; but this is utterly inviſible, even with the beſt microſcope.

This idea ſeems to be important towards accounting for the operation of a peſtilential atmoſphere on various bodies, and is confirmed by the facts related of peſtilence that has ſeized particular families or tribes of men, while others, equally expoſed, have eſcaped. This may be called natural prediſpoſition or aptitude to a diſeaſe, in diſtinction from that ſtate of the body which is the effect of artificial or accidental cauſes, and which may be the commencement of the diſeaſe, according to Brown's definition.

SINCE the firſt volume was put to preſs, I have collected from various authors, accounts of ſeveral plagues in Egypt, which I had not then found. As I have ſuggeſted that peſtilence is uſually marked by catarrh, it may be proper to lay together further evidence of the fact. Egypt and Conſtantinople are the places where autumnal fevers are moſt apt to take the form of peſtilence. Catarrh, in thoſe cities, ſeems cloſely to attend the plague. Witneſs the following examples.

A. D.
1580 influenza.
1581 deadly plague in Egypt.

A. D.	
1591	influenza.
1592 1593	general plague.
1597	influenza.
1598 1599 1600	general plague.
1602	influenza.
1603	plague.
1610	influenza.
1611 1613	deadly plague in Conſtantinople, &c.
1693	influenza.
1694	plague in Egypt.
1699	influenza.
1700	plague in Egypt.
1712	influenza.
1713	plague in Egypt.
1717	influenza.
1717 1718	plague in Egypt and Turkey, &c.
1726 1728	plague in Egypt, &c.
1729	influenza.
1732 1733	plague and influenza.
1736	plague deadly in Egypt.
1737	influenza.
1738 1739	deadly peſtilence in Weſt-Indies, Mexico, Ockzakow, &c.
1743	influenza and plague.
1744	influenza.
1745	plague in Egypt.
1758	influenza—plague began.
1759	plague in Egypt.
1762	influenza and plague in the Levant.

A. D.	
1767	influenza.
1769 1770	plague in Conſtantinople and Egypt.
1782	influenza.
1783 1784 1785	plague in Egypt and Aſia.
1787	plague in Aſia and Africa.
1788	influenza in Europe.
1789	influenza in America.
1790	influenza in America.
1791	began peſtilence in America, and Weſt-Indies which has not yet ceaſed. Severe plague in Egypt.

There are ſome long periods in which I have no account of the diſeaſes. The plague of 1705 in Egypt is the only one of which I have an account, that I cannot trace to a connection with univerſal catarrh; and I have no account of a plague in Egypt after the influenza of 1709. I aſcribe this however to the imperfection of my accounts. How greatly to be regretted is the want of accurate and complete regiſters of epidemic diſeaſes!

Let this detail of authentic facts, be compared with what every man may recollect in America. How the preſent ſeries of plagues was introduced by a double portion of catarrh! for the influenza of 1789 was followed in 1790 by another influenza—the only inſtance I can find on record of two of theſe epidemics within the ſhort ſpace of ſix or eight months! Let it be recollected alſo that catarrh was prevalent in the ſpring of 1791, 1793 and 1798, and that in our large cities, peſtilence has in every inſtance, been introduced or followed [or both] by influenza, which has ſometimes been local, that is, very much limited to the place where the peſtilence had prevailed or was to prevail. Who then can deny that catarrh and plague are connected in cauſe? It is not poſſible to deny it—the evidence is concluſive—and when this ſubject ſhall be fully inveſtigated, it will appear that peſtilence, whether plague or yellow fever, is produced by the ſame general change in the properties of the air, which produces influenza—the tranſitions from the one epidemic to the other being cauſed by the ſeaſons, or other unknown cauſe.

I learn from a communication of the Britiſh Conſul at Alexandria, that it was calculated a million of people had periſhed by the plague in Upper and Lower Egypt between 1791 and 1796; and our accounts from that country, mention that the diſeaſe had not ceaſed, the laſt ſpring; that is, it returned at the proper ſeaſon. It ſeems therefore that peſtilence in Africa runs cotemporaneous with peſtilence in America.

I have recently learnt from Irwin's Travels, that there was no plague in Egypt from 1770 to 1777, and from other writers I collect that it was not there for two or three years after. This is a remarkable fact, as Egypt is ſeldom exempt longer than five years in one period. Now it will be remarked that in the ſame period, and for ſome time before and after, no epidemic infectious yellow fever occurred in America, nor as far as I can learn, in the Weſt-India Iſlands. Yet this was a time of war between Great-Britain, America and France.* But it is a curious fact, that in thoſe parts of the earth moſt ſubject to peſtilence, the plague and yellow fever ſhould have diſappeared at the ſame time; and in countries 5000 miles diſtant, certain kinds of diſeaſes ſhould have loſt that peculiar character which diſtinguiſhes the plague.

But the hiſtory of epidemics furniſhes numerous inſtances of ſimilar revolutions in the prevailing type or character of diſeaſes.

In Mr. Tytler's Treatiſe on the plague and yellow fever, which I have juſt read, I find a paſſage, in page 379, which aſſerts that certain quotations in my letters to Dr. Currie in 1797 were made "with a view to diſpute the contagious nature of the yellow fever." This is not accurate. My view was to prove a meterial difference in the yellow fever at different times, and to ſhow certain inconſiſtencies in the reaſoning of my antagoniſt.

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* No comet was ſeen between 1770 and 1784—a period of more than thirteen years—ſuch an interval had not happened within 150 years, and probably not in three centuries.

It is proper now to mention that I wrote thoſe letters, with a view if poſſible, to ſettle the queſtion of the origin of the yellow fever, by a fair ſtatement of facts and fair concluſions from the facts. I had not then attended to the hiſtory of epidemics; and it will be ſeen by one of my letters, that I had embraced the popular opinion then current, that the influenza in 1789 and 1790 was a new diſeaſe. Since I have ſtudied this ſubject, I am ſurpriſed not only at my own ignorance, but at the ignorance of all claſſes of men, in whatever regards the hiſtory of epidemic diſeaſes, and the phyſical phenomena of the earth and atmoſphere. On this ſubject and whatever regards the origin of the plague and yellow fever, Mr. Tytler's Treatiſe has diſappointed my hopes and expections. His hiſtory of peſtilence is from firſt to laſt imperfect and inaccurate. And how it is poſſible for a man to ſuppoſe that the plague was originally ſent upon the Jews as a puniſhment, and by them has been conveyed to other nations, p. 47. or that the plague in Rome in the year 80 was occaſioned by infection conveyed from Jeruſalem, by the army of Titus in the year 70. p. 13. 45. 50. Or that it is of divine original, p. 369, any more than all other diſtempers—Or that it has been uſually propagated by war and commerce p. 369, when it is evident from ſcripture that it was a diſeaſe in Egypt, before the days of Moſes—and has in every age infeſted nations who had no intercourſe with the Jews—when alſo it is expreſsly declared by Livy and Oroſious to have been uſually in Rome in time of peace—I ſay, how it is poſſible, in this period of the world, for ſuch opinions to exiſt, I cannot conceive.

On the ſubject of contagion alſo, or rather infection, Mr. Tytler, has adopted the common theory—a theory acknowleged to be inadequate to the ſolution of the phenomena of peſtilence, as plague and yellow fever always ceaſe, at the proper ſeaſon, when the infection is moſt general.

The reſults of my inveſtigations will explain moſt, if not all, the difficulties attending this ſubject.

The origin of peſtilence is traced to eſſential changes in the atmoſphere, which recur at certain unequal periods. The evidence of theſe changes are certain epidemic diſeaſes, as meaſles, affections of the throat, and eſpecially influenza, which pervades the globe or large portions of it within a few months or at moſt, in two years. Near-the time of theſe phenomena, and uſually ſubſequent to the influenza, the plague occurs in Egypt and Conſtantinople, and if the change in the atmoſphere is very great, the plague occurs in all parts of the Levant and in other parts of Africa, Europe and Aſia. At the ſame time, in the more cool and healthy regions of the north, epidemics of a milder type than the plague, but malignant and infectious, prevail, and in ſhort, ordinary diſeaſes aſſume new and more fatal ſymptoms. In America, the ſame or ſimilar changes are obſerved. The fever of the Weſt-Indies, which is uſually not infectious, becomes more malignant and aſſumes in a degree the character of the plague. In our large cities, the autumnal remitting fever is changed into the ſame malignant form, and the country ſuffers by meaſles, ſcarlatina, dyſentery, typhus and remitting fevers. Theſe changes uſually take place in both hemiſpheres at the ſame time; but ſometimes the peſtilential principle ſeems to be more ſevere on one continent or in one country, than in another

Theſe changes are uſually diſtinguiſhed by viſible and remarkable phenomena in the natural world.

The periods of peſtilence are unequal and indefinite—ſometimes of only five or ſix years duration; at other times, extending to ten or fifteen years. But in the latter caſe, the epidemics mentioned uſually run through a country twice—that is, two peſtilential periods occur, without an interval of time.

During theſe periods, contagion and infection aid the propagation of certain diſeaſes, particularly the meaſles, ſmall-pox' whooping cough and angina maligna. In the dyſentery, yellow fever and plague, infection has its effect and obviouſly ſpreads the diſeaſes. But all thoſe diſeaſes originate without infection, in all countries where the heat, moiſture or other local cauſe will permit the diſeaſe to exiſt. In ſome caſes, they are introduced and ſpread ſolely by infection, but they are then always within human control, and it is the fault of man, if the ſphere of their operation is not very limited. In moſt caſes, theſe diſeaſes have the unequivocal characters of local epidemics, and no human power can reſtrain them.

On the ſubject of cure, if I may be permitted to have an opinion, I ſhould concur with Mr. Tytler in the preference of the diaphoretic method. Circumſtances may indeed defeat this method, and compel the phyſician to adopt others. But from the indications of nature, and the immenſe capacity of vapor to abſorb heat, I take perſpiration to be the natural remedy for fever.

On the ſubject of the proximate cauſe of the plague, the opinions of Mr. Tytler are highly reſpectable. I fully agree with him in the influence of the electrical fluid. I believe this active and elaſtic principle to be the great agent in all the changes viſible and inviſible, in our atmoſphere, and I cannot but think my inveſtigations have unlocked very important ſecrets on that point. I believe alſo that this fluid is the immediate agent in ſupporting life, and the intellectual powers. Received into the lungs, it ſupplies the body with heat, and by its elaſtic power, dilates thoſe organs of life to receive new ſupplies. The machinery of the body is thus calculated, while it laſts, to preſerve perpetual motion. At the ſame time, this fluid, by the ſame elaſtic power, becomes the medium of ſenſation, throughout the nervous ſyſtem, and by its inſtantaneous motions, communicates ſenſation and thought, with the celerity of lightning.

New-Haven, November 1799.

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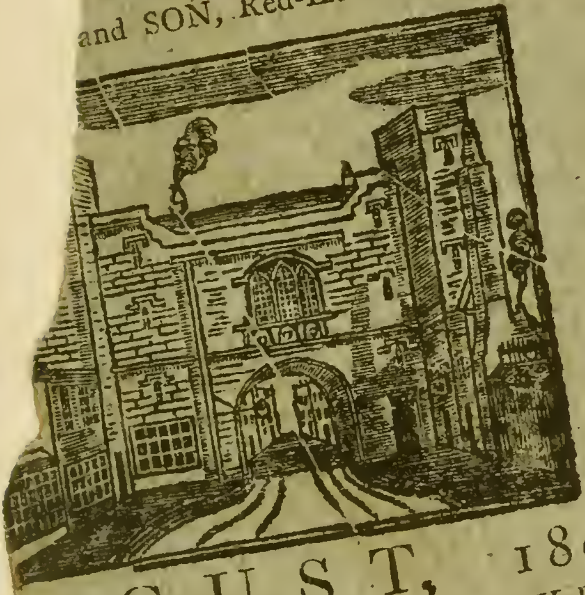
and SON, Red-Lion-Paſſage, Fleet-Street.



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